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# Prospects of the farming sector and rural development in view of food security

The case of the Russian Federation

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# Executive summary

## *Analysis of changes in the Russian agricultural sector*

1. The analysis of the ownership and access to agricultural inputs, particularly land and assets, is important for an overall assessment of food security in Russia. Agrarian reforms implemented during the transition to a market economy in post-Soviet Russia have deeply affected the reallocation of land and assets in rural areas.
2. The specific implementation of reforms in post-Soviet Russia prevented the splitting of land into thousands of small plots. However, the emergence of a market for land shares has also generated high transaction costs and corruption. Furthermore, agrarian reforms in each region of Russia had its own specific features, mainly because the privatisation of land was not homogenously carried out in all regions. For example, in some regions, preference was given to the preservation of state farms (e.g. Chechen Republic) or the creation of producers' cooperatives.
3. As a result of the reforms 11.8 million people became owners of property and land shares (approximately 120 million hectares). The majority of shareholders have leased their land. Only a small part of the shareholders got property in-kind for their shares in order to create family farms. Overall, post-Soviet reforms have shaped the structure of the farming sector in Russia and the capacity of the agricultural sector to use land and assets and therefore to produce.
4. One fundamental feature of the environment in which farmers operate is defined by the set of regulations that directly affect farming activities and define the operating framework for agricultural and rural development policies.
5. Government support for agriculture is mainly aimed at stimulating production (e.g. subsidies to support expenditures or loans), most of which has been traditionally classified in the Amber Box. Upon WTO accession the mechanisms are due to change and a strong increase in Green Box subsidies is likely to occur.
6. Although the budget for agricultural policies is relatively small in comparison with the world's largest developed economies, the provision and distribution of federal subsidies across regions requires co-financing from the republics.
7. While most of the farm subsidies are directed towards agricultural enterprises, whose output is marketed (and partially exported), the existence of farm support strongly contributes to the sustainability of many farms through positive impacts on profitability and gross agricultural output.
8. Rural development policies are very limited and cannot prevent rural depopulation and the increasing income gap between urban and rural areas.
9. Farmers perceive State Program measures as positive, though they think they have no significant impact on agricultural development. Also, farmers seem to consider the business environment as favourable.
10. The most radical changes within the farming structure over the last 20 years are the resurgence of household plots and the concentration of agricultural outputs in large agricultural organisations. Among the largest enterprises, foreign companies are typically the most efficient and profitable.
11. There have also been changes in farming practices as household plots have specialised in labour-intensive crops while agricultural enterprises have specialised in cereals and industrial crops that require mechanisation and large areas.
12. The agrarian structure across Russia has also dramatically been affected as regions have different agrarian structures: the corporate sector has prevailed in 30% of the republics, with the predominance of large agricultural enterprises, agrofirms, and agricultural holdings. Approximately the same proportion of regions is characterised by the predominance of family farms and about 40% of regions have a mixed agrarian structure.
13. The economic classification of agricultural producers of Russia, using the 2006 Census, has allowed to identify 4 classes of producers:

- i. Farms which are not functioning, which have abandoned permanently or temporarily agricultural production and/or have some off-farm activity with no agricultural activity (6 million producers);
- ii. Producers that used their land for residential and recreational purposes (23.5 million producers characterised by agricultural output less than 10 thousand roubles<sup>1</sup> per year per producer);
- iii. Agricultural producers that produced for self-consumption (3.5 million producers, agricultural output greater than 10 and less than 30,000 roubles per year per producer);
- iv. Commercial producers (4 million producers, the value of agricultural output exceeded 30,000 roubles per year per producer). Commercial producers are divided into sub-classes: subsidiary (agricultural output 30-300 thousand roubles per year per producer), farmers (300-3000 thousand roubles per year), capitalist (3-30 mln. roubles per year), and large capitalist (more than 30 million roubles per year).

*Technical and economic effectiveness of the agricultural sector*

14. The analysis of the economic effectiveness of agricultural producers has shown that the effectiveness of land use is highest for household plots. This is mainly explained by the specialisation of household plots on more intensive crops (e.g. potatoes, vegetables, fruits and berries) with higher costs of products per ha, while extensive crops are mainly grown by agricultural enterprises and family farms.
15. Until 1998, agricultural output decreased faster than employment. As a result, labour productivity dropped. Since 1998 the increase in output occurred simultaneously with the decrease of employment. This allowed labour productivity gains. These patterns have been heterogeneous across time and between operators.
16. The technical efficiency of agricultural enterprises has increased between 1995 and 2008: grain and crops (+10.4%); potato and vegetables (+54.6%); cattle (+33.4%); pig (+2.9%) and poultry (+5.3%). The transition to a market economy has forced farm operators to improve competitiveness, particularly, by focussing on the most profitable types of products.
17. In the grain and technical crop sector, agricultural enterprises have simultaneously experienced profitability and technical efficiency gains; yet the sector is not very efficient and much potential for improvement exists.

The potato and vegetable sector is very efficient and competitive.

18. The poultry sector has suffered from significant restructuring during the transition as the competition has been fierce. In the pig farming sector, the access to reliable feed markets have structurally hindered their capacity to be efficient as the reallocation of resources has affected their main activities. Similarly, the issue of multifunctionality has also affected the cattle sector, as it is often contrary to their most efficient practices.
  19. Overall, the efficiency of agricultural enterprises across the sectors is also dependent on the development of strong market infrastructures and management practices.
  20. The financial situation of agricultural enterprises, which were crippled with debt, has also improved due to the reduction in the use of unfavourable territories, the reorganisation of production and the implementation of government measures.
  21. Restructurations in the agricultural sector and improvements in the overall sector financial sustainability have allowed many farms to become profitable and have made the agricultural sector attractive to investors.
  22. In a financial context that remains relatively fragile for many farms, credit subsidies, especially those targeted at short-term loans, have significantly increased in recent years and have been mainly given to agricultural operators and processors of agricultural products.
  23. While Russia has developed and uses environmental protection measures, which are likely to improve the environmental sustainability of agriculture, measures stimulating the intensive use of natural resources for agricultural production still largely prevail over measures of land preservation.
- Drivers of food security in Russia and contribution to global food security*
24. Russia has over 90 million ha of abandoned agricultural land, but it is mainly located in areas with low bioclimatic potential. This land mainly belongs to non-operating agricultural enterprises, family farms and household plots located in the Northern and Eastern areas and in the Non-black soil zone.
  25. The reasons for the withdrawal of these areas have been the low effectiveness of such land, as well as difficulties with allotment, registration and sale/purchase (i.e. high transaction costs). Also, migrations to urban areas have led to land being withdrawn from use.

<sup>1</sup> In January 2006, the exchange rate was approximately 35 roubles per 1 euro.

26. Policy changes in land market regulations, which could lower transaction costs, as well as in rural development, which could lessen the income gap between rural and urban areas and therefore make rural areas more attractive, might offset land abandonment trends.
27. The methodology used in this report to assess Russia's potential to increase grain export takes into account the correlation between the growth of cropland areas and grain sales profitability; the cost of production of a tonne of grain in each Russian region; the cost of transporting grain by railway to export terminals, and the global grain price.
28. Although this methodology has some caveats, the assessment provides some clear insights; that is, Russia has some potential of using abandoned land and increasing its grain export assuming that the current state of physical infrastructures is maintained in the future. However, this potential is limited, unless market conditions drastically change.
29. The modernisation of production systems, the application of modern technologies, the introduction of innovations, the establishment of clear and strong procedures for input and output markets as well as the provision of support, all have a large potential to increase agricultural output and therefore contribute to domestic food security and global food markets. Policy-makers (and the agri-economy) may benefit from focussing their attention to these fundamental elements.
30. Russia experiences a serious mismatch between its grain production potential and its export potential. The latter is structurally restricted by the lack of storage, transshipment and carriage capacities which limit the potential of Russia to export the excess production. Given gross grain yield forecasts for 2020 (~133/136 million tons) and the expected growth of oil crop yields, the existing shortage of storage capacity is unlikely to be eliminated without the implementation of large investments.



# Glossary

In the report the terms listed below are used in the following meanings:

Agricultural Enterprise/Organisation – a large farm, often successor of state and collective farm (сельскохозяйственное предприятие, сельскохозяйственная организация, СХО)

Family Farm – a small and medium sized private farm established in the post reform period (крестьянско-фермерское хозяйство, КФХ)

Household Plot/Private Household Plot – an entity producing for self-consumption, which may have small-scale commodity production (личное подсобное хозяйство, ЛПХ, семейное хозяйство, хозяйство населения)

Agricultural Operators/Producers – all categories of farms (сельхозпроизводители всех категорий, хозяйства)

RF Region/Republic/Autonomous Area/Kray – a RF constituent area (регион, край, автономный округ, субъект федерации, республики)

Agricultural land – all land categorised as agricultural (сельскохозяйственные земли)

Arable land – land suitable for cultivation (пахотные земли)

Cropland – land under crops (посевные площади)

Inputs, resources – ресурсы

Commercial/commodity products – saleable surplus/marketable products (товарная продукция)



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# Introduction

As the recent situation on world food markets has been increasingly volatile and has been associated with relatively higher food prices, contributing to demonstrations and riots across the world, Russia's agriculture has attracted much attention from economists, experts and policy-makers because they believe that the country could become the world's largest and most reliable grain producer and exporter in the future and could therefore play a key role in global food security challenges. In fact, Russia, among other former Soviet Union countries such as Ukraine and Kazakhstan, has acquired a significant role in world grain markets in recent years as the expansion in domestic wheat production has resulted in increased exports. This late shift in global markets is far from being trivial, considering that the region is endowed with a large quantity of land with the most fertile soil (i.e. black soils) and that a relatively small proportion of land is dedicated to agricultural production. Some have already predicted that the region would supplant the United States as the wheat breadbasket of the world in the next decade (Liefert et al., 2010). However, the great potential for agricultural production and export in the region also seems particularly constrained by ad hoc policy decisions, the lack of financial liquidity or the existence of institutional and infrastructural issues (Fellman and Nekhay, 2012). Furthermore, the role of the region has been shaped by structural changes in the farming sector and rural areas which have resulted from the transition from a planned economy to a market economy.

In that context, the aim of this report is to evaluate the role of the Russian Federation towards fulfilling domestic food security and more importantly global food security in the short and medium run. In particular, the study aims at examining if Russian farms could substantially increase further their respective output and export levels. The methodology followed in this report is a bottom-up approach, i.e. going from the farm (i.e. microeconomic level) to the food market (i.e. macroeconomic level), that explicitly considers the analysis of food security at farm level and therefore complements well other works which study the agri-food sector in Russia at a more aggregated level (Salputra et al., 2013). The perspective of the report is made possible by the use of a wide range of farm-level databases that are, for most, only available to Russian researchers and allow going into a more disaggregated and detailed level of analysis. The report is structured around three chapters. While the first and second chapters jointly provide the agricultural and

rural development background for Russia and are especially useful for the overall assessment of Russia's potential for agricultural productivity increases, the third chapter specifically addresses the issue of food security and its drivers in Russia.

Since the fall of the Soviet Union, farms in Russia have been operating in completely new conditions. The chapter **Analysis of changes in the Russian agrarian sector** (Chapter 2) describes the principal phases and mechanisms of land privatisation and reorganisation of former collective farms and also analyses the results of land reforms. Further, Chapter 2 reviews and assesses the current agrarian policy; in particular, the role of subsidies on the agricultural sector is examined. It concludes with a detailed economic classification of Russian agricultural operators, which allows identifying the main engines of today's Russian agriculture, i.e. large commercial agricultural enterprises. The legislative and economic environment has fundamentally changed following the implementation of agrarian reforms in post-Soviet Russia. These reforms that took place over the last 20 years have led to many structural changes in the agricultural sector. The chapter **Analysis of effectiveness and sustainability of the agrarian sector** (Chapter 3) aims at analysing how the performance of agricultural operators has been affected during this period. First, Chapter 3 describes the recent evolutions of the agricultural sector through a review of economic performance indicators. Chapter 3 assesses the technical efficiency of agricultural enterprises based on Data Envelope Analysis, which provides information on the capacity of farmers to use their resources effectively. Their financial sustainability is also studied. While Chapter 2 describes changes in the policy and economic environment in which farmers now operate in Russia and Chapter 3 examines how the agricultural sector has been affected by the reform process, the chapter **Factors for increasing Russia's own food security and contribution to the global food security** (Chapter 4) aims at assessing whether Russia is able to make a contribution to global food security. Based on findings from Chapters 2 and 3, Chapter 4 first explores the possibility to increase Russia's grain export potential by means of using abandoned agricultural land. Chapter 4 also includes forecasts of crop yields and livestock productivity, an analysis of practice of best Russian agricultural enterprises, as well as a comparison of yields and productivity patterns in Russia with other countries.



## 2. Analysis of changes in the Russian agricultural sector

The assessment of the potential of Russia to ensure domestic food security and to contribute to the global food security first requires the necessary understanding of the legislative and economic environment in which farmers operate and how it has dramatically changed during the transition period. This chapter examines the reforming process of the agrarian sector in Russia and fundamental institutional changes that have occurred in the past 20 years. Special attention is given to the mechanisms of land privatisation and restructuring of collective and state farms with regional specificities (Section 1), as well as to rural and agrarian state support policy (Section 2). The following institutional changes are also analysed: the changing role of state and private agricultural enterprises, family farms; the formation of agricultural holdings and consumer cooperatives of family farms. After having reviewed and explained the background for agricultural and rural development policy, Section 3 examines how years of numerous reforms have shaped the agricultural sector and further develops an original economic classification of agricultural producers in Russia to review the current features of the agricultural sector in Russia.

### 2.1. Agrarian reforms in post-Soviet Russia

The level of food security of any country is largely determined by two factors: the ownership of the (major) inputs needed for agricultural production and the access of rural residents to these inputs. The present distribution of these inputs is predetermined by the peculiarities of the agrarian reform in Russia, as well as the institutional environment in which the reallocation of resources of former collective and state farms between family farms, agricultural organisations and the State was performed. This section focusses on the particularities of the privatisation of land and assets of Soviet agricultural organisations, on the restrictions to the redistribution of land and assets to the private sector, and on the advantages/disadvantages of the way agriculture was privatised. Section 1 also discusses several issues of the existing system of land use and ownership and factors that have contributed to deprive the rural population of land.

#### 2.1.1. Privatisation of land and property of collective and state farms

Agrarian reforms in Russia were conducted in the context of overall economic reform in the country and included land reforms, reforms of agricultural enterprises and reforms of agricultural State management. They began with the introduction of amendments to Article 12 of the Constitution of the Russian Soviet Federative Socialist Republic (RSFSR) in December 1990 (Law of the RSFSR, 1990).

##### *Early land reforms*

The State acknowledged that products and assets of agricultural enterprises became the property of those agricultural enterprises. The same amendment established that land plots for agricultural production were provided by the State for use, possession or ownership. The confiscation of land, except as specified in the legislation of the RSFSR, was not allowed. The purchase and sale of land acquired within 10 years from the moment of acquisition of ownership rights were not permitted, at the exception of selling land to the State<sup>2</sup>. Later, the ban on land sales was removed in connection with the adoption of the new Constitution of Russian Federation in December 1993.

The fundamental legislation on land reform was the Law “On Land Reform”<sup>3</sup> and included multiple issues (i.e. land, types of agricultural enterprises, status of family farms and state regulation of agriculture), which allowed considering this act as an agrarian reform law. It specified that the aim of the reform was redistribute land in order to create favourable conditions for the equal development of all forms of operators engaged in agricultural production and the rational use and preservation of land. Under this reform state land was transferred to citizens and organisations through rights of use, lease or ownership. The transfer of ownership was carried out free of charge within established

<sup>2</sup> However, it was stipulated that if within this 10-year period a referendum concerning possibility of land selling was held, then its decision would prevail.

<sup>3</sup> Russian Soviet Federative Socialist Republic dd. 27.12.90 N 460-1

bounds<sup>4</sup>. Beyond these limits land was made available for a fee. The right of ownership could be granted to citizens or legal operators that had already used state land plots at the time of privatisation. A notable exception was made for land owned by agricultural enterprises. During the reorganisation of agricultural enterprises, agricultural land that belonged to such enterprises was given to employees and/or retirees of these enterprises and local social workers, who became new landowners. Non-agricultural land remained in state ownership and was transferred to the legal successors of reorganised agricultural enterprises.<sup>5</sup> Therefore the newly established agricultural enterprises had to form their land tenure by entering into agreements with new landowners (or the State). It was assumed that, during the conclusion of these agreements, the land of former collective and farms will be redistributed among the successors of collective and state farms, other agricultural organisations and farmers.

### *Organisation of land reform management*

The task of carrying out land reforms was given to the local Councils of People's Deputies, the State Committee on Land Reform, the Ministry of Agriculture and Food of the RSFSR and the Ministry of Forestry of RSFSR<sup>6</sup>. The State Committee on Land Reform was to provide land use planning, organisation, control and advisory functions for the implementation of the reform. Most of the work on the redistribution of State land of former Soviet agricultural enterprises was financed by the State budget (i.e. development of land redistribution plans between the State, groups of citizens and farmers; appraisal of arable land, determination of the size of the share of land for each claimant, development and implementation of decisions on privatisation). The State made a decision to allow the privatisation of land plots, which were used primarily for self-consumption purposes (e.g. household plots and gardens). Documents that certified these rights were issued. The allocation of land and issuance of the relevant documents for farmers were performed at the expense of the State budget.

In the Law "On Land Reform", it was further suggested that the State should contribute to the development of all forms of agricultural producers: state, private and collective agricultural enterprises, family farms, cooperatives and their associations. The Law also declared the equality of all forms of ownership and organisational forms. The State monopoly on land was abolished and payments for land use

were introduced. It is noteworthy that foreign operators, in accordance with this regulation, could not be landowners. More fundamentally, the law prohibited State bodies to intervene in economic activities of private agricultural producers.

The distribution of the property of collective and state farms was carried out according to the following rules:

- The State transferred the property<sup>7</sup> to the employees and retirees of these enterprises (Amendment to the RSFSR Constitution dd. 1990).
- A group of employees and pensioners of agricultural enterprises that were eligible to participate in the privatisation of the farm assets was first formed, the applicants for property shares were determined.
- The value of the enterprise property to be redistributed between the applicants was calculated by subtracting debt value from the property value.
- The share of each claimant in the assets of the reorganised collective or state farm was determined by the method<sup>8</sup> based on the duration of the claimant's work in the specific farm and the salary paid.
- The share of each property (property share) claimant was then calculated.
- In exchange of such a property share its owner could get the property to organise a family farm.
- Group owners could form a new organisation, contributing their property shares to the authorised capital. The property of the former collective or state farm relevant to the contributed shares was passed on to a new organisation. Debt obligations were shared by all farmers and the new organisations in proportion to the value of obtained property, i.e. such new organisations became successors to the former collective or state farms.
- Land privatisation was carried out following the Law "On Land Reform" and subsequent decisions of the President and the Government of the Russian Federation. Most of the agricultural land was transferred to employees, retirees of the former collective and state farms, and/or rural social workers, free of charge within the set limits. Each group of owners typically involved between 500 and 1,000 people. All fields, orchards, vineyards, hayfields and pasture areas of one agricultural enterprise were transferred to the common property of the "collective" in the form of a multi-circuit plot with one cadastral number. The area of

4 In majority of agricultural enterprises norms were set at 4-7 ha. However they could vary substantially by regions. For example in Moscow region the norm was 1 ha while in several districts of Volgograd region – up to 30 ha.

5 The whole territory used by agricultural organisation or family farm is classified as farm land. It comprises of agricultural land (used for producing agricultural production. It includes arable land, pastures, perennial plants, hayfields etc.) and non-agricultural land (not used for agricultural production – forests, wetlands, in-farm roads, areas under farm buildings etc.). Non-agricultural land incorporates roads, wetlands, ponds etc.

6 Other interested ministries and agencies could also be involved.

7 Enterprises that were of great importance for the industry – breeding and experimental stations, racecourses, etc. remained under State ownership and could not be reorganised. Their land could not be privatised and remained in State ownership.

8 For a description of the method, see Shagaida (2010).

this multi-circuit plot was usually around 3-7 thousand hectares. Each of the collective members got a share in the right to the plot in the common ownership. Agricultural land in excess of the set norms was transferred to a special land redistribution fund in order to ensure access of other individuals and organisations to agricultural land. Non-agricultural land remained in State ownership.

### *Redistribution of agricultural land and assets of Soviet agricultural enterprises*

The way the privatisation of agricultural land of collective and state farms was conducted in Russia, has predetermined the emergence of specific land sites, which were not allocated in-kind. As a rule, in the area previously occupied by a collective or a state farm, there emerged one land site in common ownership of a group of citizens and several farmers' plots. Following the privatisation, there were about 26,000 of such sites in common ownership, each combined of hundreds of individual fields, hayfields and pastures. The typical area of such a site was a few thousand hectares. The owner was traditionally a group of several hundred people. Transactions with (and within) such sites were not possible because groups of owners could never make unanimous decisions on the sale or lease of the sites. Special mechanisms were created in order to ensure the mobility of these sites, among which the most important were the following:

- Mechanism of allocation of smaller sites from a site in the shared common property: The participant (or group) participating in the common ownership of a particular site could allocate plots of land for farming, lease or sale at the expense of their land shares.
- Mechanism of transactions with land shares and allocation of land at the expense of these shares. Transactions with land shares – sale, rent, donation, entering into authorised capital, etc. were permitted. Any person could enter into agreements with several owners of land shares, i.e. concentrate land shares, and then – allocate land for agricultural purposes.

Conditions were created to reduce such areas and the number of co-owners of these special sites in order to ease the concentration of land shares in the hands of users (agricultural organisations, farmers). This was followed by the actual allocation of consolidated plots from the original sites created during the privatisation of land. The technology of land privatisation in Russia thus predetermined to a large extent the emergence of a market of land shares rather than a market of land.

### *Critical assessment of Russian land privatisation*

The specific approach to land privatisation followed in Russia (i.e. transfers of very large plots – thousands of hectares – to a large group of people – 300/400 persons – where each person obtained a right for a land share) has often been criticised. However, it had a few significant advantages

over a scenario where each proprietor would have got an individual land plot:

- it was fast, as the privatisation of almost 114 million hectares of agricultural land was carried out in 4 years, during 1991-1994;
- It prevented conflicts as citizens did not receive individual plots, which could have been different in quality and location. Conflicts arose only when a farmer or agricultural organisation that accumulated land shares wanted to allocate the actual plot in a particular location<sup>9</sup>.
- The market of land shares allowed farmers to concentrate them on the first stage, and then to allocate the consolidated sites. Thus, there was no problem of consolidation of individual plots, which occurred in other former Soviet Union countries where individual plots were allotted during privatisation.

Of course, the limitations of this approach are obvious and can be derived from its strengths:

- sales and other commercial turnover of sites in common ownership were impeded by a great number of co-owners;
- Conflicts emerging when dividing sites in common ownership were not entirely avoided, but only deferred. However, this disadvantage could be essentially prevented as the purchase of land shares reduced the number of co-owners of common property, and therefore the number of potential disputes;
- Specific mechanisms created for land in common property (such as allocation of land plots, decision-making on use, settlement of disputes) were not flexible enough to suit every landowner.

As mentioned above, each new agricultural organisation could form their own land tenure on the basis of formal agreements with landowners (citizens or State). In practice, few new agricultural organisations used that possibility. This can be partly explained by the fact that many expected that the reforming process would be curtailed, as there was much uncertainty on the future of this reform before 2001. There were political debates, appeals for land nationalisation and administrative restrictions of land redistribution to new users. During this period, the demand for land was also low and existed only in specific regions. Such demand for land was formed by farmers, organisations or individuals interested in acquiring land for development. Most managers of agricultural enterprises, traditional land users, did not want to spend time and money on the legal registration of land use. They used land on the basis of verbal agreements with owners (or often without their agreements). After 2001, it

<sup>9</sup> Several methods to solve these conflicts were developed, e.g. the organisation of land auctions (Shagaida, 2010).

became clear that land nationalisation would not take place as the new Land Code was adopted in 2001. In 2002 a special law “On the Turnover of Land Designated for Agriculture” was adopted and introduced new mechanisms for the allocation of land plots for property shares, transactions with land in shared ownership.

### *Land market restrictions*

The mechanism of land privatisation and reorganisation of collective and state farms enhanced the mobility of assets and land of former Soviet agricultural enterprises. The reform created the conditions under which, theoretically, land and property could pass from legal successors of collective and state farms to new operators. However, several constraints emerged during the reforming years that had various impacts on the situation. First, until the end of the 90ies, the influence of the Communist and Agrarian political parties were strong at regional level. Regional authorities, as a rule, limited the transition of land and property from former collective and state farms to individual farmers and organisations created by a small number of citizens. By 1995 the number of agricultural enterprises had increased only by 4 % (compared to 1990). Just over 5 % of agricultural land had passed onto family farms during this period. As a result, land and property mostly remained within agricultural enterprises (MOA, 1999).

Moreover, high inflation rates led to an increase in debts of agricultural enterprises. State support to agriculture sharply decreased. In 1994 the share of unprofitable agricultural enterprises amounted to 61% of the total, and by the end of 1998 – to 84.4%. Agricultural organisations accumulated debts, which had to pass to new organisations. Under such conditions of indebtedness, the incentives for former employees of collective and state farms to create new organisations or to become farmers were extremely limited. The predominant form of revitalisation became reorganisation, i.e. a parent organisation was replaced by a new one with the size of the former. All the property of the parent organisation and all the debts were passed to a newly created one. As a rule, the former chief of a Soviet collective or state farm became the head of the new organisation and obsolete management practices continued under market economic conditions that required new approaches to management. According to the legislation, the privatisation of land and property of former collective and state farms was implemented for the benefit of rural populations<sup>10</sup>. These new owners had the lowest income in the country and could not invest in agricultural businesses. The situation was hampered by the low profitability of agriculture. Interest rates on bank loans reached 1,000 %, which made them inaccessible and farms could not develop.

Finally, the existence of administrative restrictions on bankruptcy procedures was mainly caused by fear of social conflicts; in rural areas there were almost no other places of employment, besides agricultural organisations. Such constraints limited the transition of agricultural organisations and the transfer of their property to new owners. The overview of the main constraints above shows that there were serious limitations to restructuring and upgrading the property of former collective and state farms.

### **2.1.2. Reforms at regional level**

The federal structure of Russia required that the decision to initiate land privatisation had to be taken by the republics of the Russian Federation. These decisions were made at different periods of time and have had long lasting effects. For example, today, it is still not allowed to privatise land of former collective and state farms in five republics of Russia (Chechnya, Dagestan, Ingushetia, Kabardino-Balkaria, and North Ossetia)<sup>11</sup>.

The transfer of small plots of land into ownership of rural residents for the organisation of small farming is often considered a goal of key importance and a way to prevent, at least partially, and to fight local unemployment. However, in these regions, all land used by farmers and agricultural organisations still remains in State ownership. Land sales under State ownership and the emergence of private ownership on land, i.e. privatisation, should only take place after 2053. Moreover, there are no rules allowing the redistribution of State and municipal land between users through transparent procedures. Obviously, agricultural land is used in these regions, though via unofficial manners. If we look at the comparison of the structure of agricultural production with the officially registered land use, the overwhelming majority of agricultural products of these regions are produced in household plots while the land is mostly concentrated in agricultural organisations. It is clear, that the land of the latter is used by households, but there is no evidence of this in official statistics.

While federal legislations defined the general scheme of the reform, at the regional level much more was determined by the position of local authorities. This is revealed not only through the different start dates of land privatisation at regional level, but also in the speed of its implementation, reorganisation of collective and state farms, in the prevailing forms of created organisations, in the share of agricultural land transferred to family farms, in prevailing types of land transactions, in carrying out the insolvency proceedings of agricultural enterprises, in the expansion of agricultural holdings, etc... All these features, eventually, have resulted in different ownership structures on agricultural land and in regional disparities with respect to the agrarian structure.

<sup>10</sup> According to the Law “On Land Reform” the land was transferred to the employees of agricultural organisations and rural social sphere. Usually they were people with small salaries with no savings to invest.

<sup>11</sup> As could be expected, those regions located in the North Caucasus do not play a significant role in Russia’s agricultural production.



### 2.1.3. Results of land reforms

#### Changes in land use

In 1990, collective and state farms used 213.8 million hectares of agricultural land. Of these, at the beginning of 1999 – when, in fact, the privatisation process was over – 114.8 million hectares of land were transferred to employees, retirees of these farms and rural social workers. According to the rayon<sup>12</sup> committees on land reform and land management only 11.8 million of people received this land. In addition, some farmers received land from regional funds of land redistribution.

During those reforms, citizens who produced agricultural products primarily for their family received plots, which they were already using before the reforms. They obtained those plots based on ownership or use rights. In most cases individual sites were also received by farmers. Most of the land of former collective and state farms was transferred

to the common property of employees and retirees of these enterprises as well as rural social workers. The major part of this land was in shared ownership. Table 1 provides information on the redistribution of agricultural land between the main groups of agricultural producers.

Table 1 shows that reforms led to a fundamental restructuring of agricultural land use. 23 million of hectares have been transferred to the jurisdiction of administrations of different levels. These lands have been withdrawn from agricultural turnover; only a small part of them was used for settlements development. For 20 years the share of land, used by citizens (including farmers) for agricultural production has increased from less than 2% to 36%. Today, 12.5% of all agricultural land in Russia is operated by family farms. About 57% of all agricultural land of the country is concentrated in non-state agricultural organisations. The area of agricultural land used by State organisations has dropped by a factor of 13 and represents less than 3% of total agricultural land.

	1990		2011	
	million ha	%	million ha	%
Family farms	0	0	23.8	12.5
Citizens (non-farmers)	3.8	1.8	44.9	23.5
Non-State agricultural enterprises*	84.9	39.7	108.2	56.7
State and municipal organisations	117.3	54.9	9.0	4.7
Other organisations	7.8	3.6	4.9	2.6
<b>Total</b>	<b>213.8</b>	<b>100</b>	<b>190.8</b>	<b>100</b>

Source: Goskomstat of Russia, 1995; Rosreestr, 2011

12 According to administration division of the Russian Federation, its regions (i.e. oblasts, republics or autonomous counties) are further divided into rayons (districts).

### Change in landownership

The structure of agricultural land for legal operators varies considerably by type of ownership (Table 2). Newly established agricultural organisations use primarily agricultural land that is owned by groups of citizens (i.e. in shared ownership), 72.5%. The share of land that is owned by these organisations themselves in general constitutes only 8.3%. However, this share is growing. <sup>13</sup>

In some regions, the share of agricultural land owned by legal operators amounts to 40% (Table 3). Agricultural land in State ownership is mainly used in other organisations - state and subsidiary farms of non-agricultural organisations.

The concentration of land in the ownership of legal operators has its advantages and disadvantages. While it increases the potential mortgage base of agricultural organisations, farmers suffer from a reduced access to land. Only 30% of agricultural land used by farmers is actually owned by them (Table 4). Farmers actively lease land which is in shared ownership of citizens. However, State land is still a valuable resource for farmers - the share of state-owned agricultural

land in their areas reaches about 39%. Farmers lease 7.8 million hectares of land from the State. Territories on which privatisation of land has not been carried out contribute to the high share of State land (0.3 million hectares). Plus, also there are State owned land sites of the first farmers who received land before the privatisation of agricultural land occurred based on the rights of permanent use and inheritable possession (1.8 million hectares).

Citizens, who are not engaged in farming, also own various land sites for agricultural production. There are 11 different types of sites: household plots, orchards, plots for haying and grazing, gardening and so on. Different terms of privatisation were applicable to these sites depending on the type of their permitted use. For example, plots for gardening, country house plots, household plots were privatised by citizens free of charge, if the area of these plots did not exceed certain norms. Plots for gardening, haying and grazing were subject to lease. Later, it became possible to obtain land for gardening on the right of ownership, but areas for haying and grazing remained in state ownership and could be only leased. Nevertheless, given the current ownership structure, private ownership is currently dominating.

**Table 2: Structure of agricultural land in legal operators by type of ownership, %**

Legal operators	land in ownership of				Total
	Agricultural enterprises	Shared ownership	State	Other owners	
Agricultural enterprises (Partnerships, societies, cooperatives)	8.3	72.5	18.2	1.0	100
State organisations	0.4	6.7	92.5	0.4	100
Other organisations <sup>13</sup>	12.0	23.6	63.6	0.8	100
<b>Total</b>	<b>7.9</b>	<b>65.7</b>	<b>25.5</b>	<b>0.9</b>	<b>100</b>

Source: Rosreestr (1.01.2011)

**Table 3: Regions with the largest share of agricultural land owned by legal operators**

Region of Russia	Share of agricultural land owned by legal operators, %
Tatarstan Republic	30.5
Kaluga region	30.9
Moscow Region	36.6
Yaroslavl region	37.5
Kaliningrad region	38.1

Source: Rosreestr (1.01.2011).

<sup>13</sup> Other organisations: non-agricultural enterprises in which agriculture is not a main activity (churches, army, schools, prisons, factories producing agricultural products for self-consumption, etc.).

**Table 4: Plots of agricultural land used by citizens for agricultural production, by ownership, %**

	Owned by				Total
	users	State	group of citizens (common ownership of other citizens)	other owners	
Family Farmers	30.2	38.6	29.2	2.0	100
Other plots of citizens	61.1	38.7	0.1	0.1	100

Source: Rosreestr (1.01.2011)

#### 2.1.4. Post-reform land and agrarian legislation

One of the features of carrying out an agrarian reform<sup>14</sup> in Russia was that the laws only outlined a general direction of transformations at the initial stage. In 1990 three laws were adopted: “On Land Reform” (1990), “On Family Farms” (1990), the Land Code of the RSFSR (1991). From 1991 to 1996 the most revolutionary legislative acts had entered into force (i.e. Government resolution #86 “On Reorganisation of State and Collective Farms” in 1991; Government resolution #96 “On the Procedure for Exercising the Rights of Land and Property Owners” in 1995). They ensured land privatisation and the establishment of private agricultural organisations and family farms. However, these regulations were not actual laws and Codes, but rather Presidential Decrees and Resolutions of the Government of the Russian Federation. The reason for this choice could be found in the inter-relations of political forces in the Parliament, which prevented any laws and codes to be adopted by the Parliament between 1991 and 1994. The adoption of laws resumed only at the end of 1994. They were of two types: general laws regulating the agricultural sphere, along with other sectors, and special laws, concerning only agricultural matters. The latter included Laws “On Agricultural Cooperation” (1995), “On State Regulation to Ensure the Fertility of Agricultural Land” (1998), “On Turnover of Land Designated for Agriculture” (2002), “On Financial Revitalisation of Agricultural Producers” (2002), “On Household Plots” (2003) “On Family Farms” (2003), “On the Development of Agriculture” (2006).

#### *Replacement of special mechanisms on agricultural land markets*

New and more general laws gradually replaced the special mechanisms developed during the reform for the turnover of agricultural land and agricultural organisations. These general mechanisms did not consider the status of any special objects created during the reorganisation of Soviet agricultural enterprises. With respect to agricultural land, this replacement led to an increase in transaction costs for protecting the rights of landowners in shared common ownership. Due to very high transaction costs, only 10% of the total land area allocated to the shared ownership, approximately 19.1 million hectares, was recorded in

the “Unified State Register of Real Estate Rights and Transactions” that was introduced in 1998. Therefore only registered land sites could effectively legally participate in official land markets. The most important laws of the post-reform period were the Federal Laws:

- “On Turnover of Land Designated for Agriculture”;
- “On Financial Revitalisation of Agricultural Producers”;
- “On the Development of Agriculture”.

First, the Federal Law “On Turnover of Land Designated for Agriculture” stipulated several special issues:

- Specificity of agricultural land rent and sale operations;
- Possession and disposition of the sites in common ownership;
- Transactions with land shares;
- Restrictions on land concentration, sites splitting, ownership of agricultural land by foreigners.

Restrictions on the concentration of land and property as well as constraints concerning ownership of agricultural land by foreigners and foreign companies could be easily evaded and could not be considered as real restrictions. This law regulated a range of issues, but it did not have a major impact on transactions with land shares and plots. Higher transaction costs associated with the turnover of agricultural land were caused by stipulations of general laws on registration of land rights and land transactions (Shagaida, 2010). These general laws were responsible for the prevailing practice of informal land use and a massive shift of landownership from primary proprietors (who received land rights during the reforms) to other persons and operators, capable to cover these expenses.

Second, the Federal Law “On Financial Revitalisation of Agricultural Producers” allowed a large restructuring of debts for many agricultural organisations. Yet, it was only possible if an organisation was capable to pay current taxes and to cover other expenditures. In this case a penalty fee was written off and the payment of the basic debt was postponed for some years (not less than 4) and was subject to a deferred payment (for the term of not less than 5 years).

<sup>14</sup> In this report, post-reform land and agrarian legislation means legislation introduced after the 1996.

Third, the Federal Law “On Household Plots” regulated the rights of citizens engaged in household subsidiary farming, their land and property relations, and inter-relations with the State. The necessity of adopting this law was driven by the need to define a category of citizens, who produced agricultural products mainly for the needs of the family, including sale of surpluses. Revenues obtained from the sale of these agricultural products were not subject to taxation. In the middle of 2011 the Act was amended and revenues are not subject to taxation provided that the area of a plot does not exceed 0.5 hectares (regional authorities have the right to increase this area up to 2.5 hectares) and no hired labour is used.

Last, the Federal Law “On the Development of Agriculture” established the legal basis for the implementation of state social and economic policy in the sphere of agriculture. It specified the definitions of “agricultural producer” (that apply for government support), “agricultural production” (as an activity supported by the State). Principles, directions and implementation measures of State support policy were also defined in the Law. The Act implied the adoption of the State Program for the Development of Agriculture and the Regulation of Markets of Agricultural Products, Food and Raw Materials. This program was a document defining the objectives and basic directions for the development of agriculture and regulation of the specified markets for a 5-year period, including the implementation of mechanisms and funding. The law defined the main directions of State support: provision of equal access to credit (subsidy on interest rates), support for agricultural insurance (subsidy), subsidy to improve soil fertility and protection of agricultural land, State intervention to regulate the procurement market of agricultural products, raw materials and food. As of today, the second program for the 8-year-old period (2013-2020) is under development.

Overall, land privatisation contributed to the increase of wealth of rural residents. The possibility of transfer of inputs from inefficient to efficient agricultural producers also emerged. However, the introduction of new institutions that regulated land transactions led to high transaction costs of protecting the rights of landownership and land transactions. Privatisation of property and land of agricultural organisations by poor rural population limited the inflow of capital into agriculture. High transaction costs, coupled with the fact that initial owners of land and property lacked capital, created conditions for a further significant redistribution of rights on land use (and in some cases - property rights) in favour of large agricultural operators and holding companies. From the standpoint of food security, the effects were ambiguous. On the one hand, investments from large agricultural producers led to an increase in agricultural production. On the other hand, the concentration of land in the hands of large producers restricted access of family farms to land and reduced employment in rural areas.

## 2.2. Agricultural and rural development policy

One fundamental element of the environment in which farmers operate is the set of regulations which directly affect farming activities and encompass documents which loosely define the operating framework for agricultural and rural development policies as well as those which precisely define farm support policy instruments. This section describes the implementation of the agrarian and rural policy in the Russian Federation. The issues of food security, state support, its level and composition, and access of different categories of producers to State support, its impact on the development of agriculture, the role of regions in financing farm support measures are addressed. Incentives and constraints in the development of agriculture and rural areas are also analysed.

### 2.2.1. Food security doctrine

At the beginning of 2010 President Medvedev approved the Food Security Doctrine, which was developed within the framework of National Security Strategy of the Russian Federation until 2020. Before accepting this document, the concept “food security” was interpreted in Russia as the satisfaction of national demand by means of domestic agricultural production. In the Doctrine this concept has been treated according to international practices and is now understood as the “provision of the population of the country with safe agricultural products, fish and other aquatic products from biological water resources (hereinafter - the fish products) and foodstuffs”. Domestic production is seen as a guarantee of access of the population to safe foodstuffs. The concept of “food safety” has been transformed to the concept of “food independence of the Russian Federation”, which is understood “as sustainable domestic production of foodstuffs in quantities not less than the established threshold share values of products in the commodity resources of the domestic market of relevant products”. For the first time, concepts such as “ratios and criteria of food security”, “economic access to food”, “and physical access to food” are developed and risks and threats to the provision of food security of the Russian Federation are listed. In addition, the main directions of State policy in the field of food security in the Russian Federation have been formulated. Domestic food security is referred to as “the condition of a national economy, at which food independence is provided and physical and economic access of each of the citizens to foodstuffs that meets the requirements of the legislation of Russian Federation on technical regulations, in amounts not less than rational norms of consumption of food needed for an active and healthy lifestyle is guaranteed”. It is also noteworthy that, at the same time, indicators which would characterise population access to foodstuffs are absent. Further, the document also specifies indicators of the share of domestic products in the commodity resources as criteria of food security:

- grain - not less than 95 per cent;
  - sugar - not less than 80 per cent;
  - vegetable oil - not less than 80 per cent;
  - meat and meat products (converted to meat) - not less than 85 per cent;
  - milk and milk products (converted to milk) - not less than 90 per cent;
  - fish products - not less than 80 per cent;
  - potatoes - not less than 95 per cent;
  - Salt for food consumption - not less than 85 per cent.
- sustained character of its implementation;
  - one market for agricultural products, raw materials and food;
  - provision for equal conditions of competition in this market;
  - Availability of information on State agricultural policy.

Results for 2011 show that indicators of the Food Security Doctrine have been achieved on major agricultural products: grain, sugar, potato, vegetables, poultry meat. It is planned that domestic demand for pork would be covered by national production within 2-3 years.

In spite of updating definitions listed in the Strategy to international standards, the document retains traditional concepts of what was considered to be the country's food security (i.e. achievement of the set thresholds of self-provision with basic food products), as well as traditional ways of increasing (and justifying) the intensification of production on the basis of which it was supposed to ensure food security.

### 2.2.2. State support of agricultural producers: legislation, mechanisms and levels

Support for the development of agriculture is carried out in accordance with the Federal Law N 264-FZ "On the Development of Agriculture" and State Program for the Development of Agriculture and the Regulation of Markets for Agricultural Products, Food and Raw Materials for the years 2008-2012 (hereinafter referred to as State Program).

#### *The Federal Law*

The Federal Law N 264-FZ defines the main terms used to organise support, such as agricultural producer, agricultural production, market of agricultural products, food and raw materials, sustainable development of rural areas, State agrarian policy. The objectives for which the State support is provided, its principles, directions, measures of implementation and other relevant conditions are also described in this Law. The declared principles of State support of agricultural producers are the following:

- availability;
- focus on the targeted groups of beneficiaries;

At the same time, compliance with these principles has not fully been observed in practice. For example, the structure, conditions and level of support are adjusted almost every year, which complicates the planning of activity by agricultural producers, even in the short term. Depending on the differences in regional budgets and regional agrarian policies, the access of agricultural producers to the same set of measures of support is not possible and varies considerably across different regions of Russia.

#### *The State Program*

The Federal Law only provides a framework for the organisation of support. The State Program developed according to the requirement of this Law, specifies its provisions. The State Program is the main official document that set out the objectives, tasks, directions of the development of agriculture and its corresponding markets and measures of State support aimed to achieve them in the medium term. For each measure, its goal, potential participants, the amount of funding (on annual basis), the level of support for participants from federal and regional budgets, the mechanism of implementation, target indicators (which should be achieved as a result of each year) are identified in the State Program.

A five-year Program was carried out for 2008-2012. A State Program for the eight-year period (2013-2020) is under development. The State Program is developed by the Ministry of Agriculture of the Russian Federation and is confirmed by the Resolution of the Government of the Russian Federation after approval of the Ministry of Economic Development and the Ministry of Finance of the Russian Federation. The State Program developed for 2013-2020 also takes into account the provisions of the Concept of Long-Term Socio-Economic Development of the Russian Federation until 2020, the Food Security Doctrine of the Russian Federation, and the Concept of Rural Development for the period until 2020. The objectives of the development of agriculture for 2008-2012 under the current State Program are the following:

1. Sustainable development of rural areas;
2. Improving competitiveness of Russian agricultural producers;
3. Preservation of land and other natural resources.

To each objective of the State program there are defined corresponding tasks, dedicated measures, as well as mechanisms of their implementation and target indicators to assess the efficiency of the measures. Measures in the State program are merged into sections. The real priorities of State policy can be estimated not by the sequence of objectives listed in the State Program, but by the actual funding (Table 5) and by the list of main target indicators of socio-economic development of agriculture. The following 9 main target indicators are established:

1. index of agricultural production in farms of all categories (in comparable prices), in % to previous year;
2. index of livestock production in farms of all categories (in comparable prices) , in % to previous year;
3. index of crop production in farms of all categories (in comparable prices) , in % to previous year;
4. index of investments into fixed capital of agriculture, in % to previous year;
5. disposable resources of households in rural areas per household member per month;
6. share of Russian production in meat and meat product (converted to meat) resources, and in milk and milk product resources, %;
7. renewal coefficients for main types of agricultural machinery in agricultural organisations (tractors, forage harvesters, grain harvesters);
8. total power of the engines of tractors, combine harvesters and self-propelled machines in agricultural organisations per 100 hectares of crop area;
9. Index of labour productivity in the farms of all categories, in % to previous year.

**Table 5: Financial Provision for State Program from federal budget by directions of support<sup>15</sup>**

Directions of support	2008		2009		2010		2011	
	billions of roubles	%	billions of roubles	%	billions of roubles	%	billions of roubles	%
Sustainable development of rural areas	8.137	6.9	8.962	5.4	7.72	7.2	7.72	6.2
Provision for general conditions for agriculture	17.707	15.0	17.714	10.7	10.068	9.4	11.499	9.2
Development of priority agricultural industries	13.144	11.1	16.417	9.9	10.585	9.9	23.129	18.5
Achievement of financial stability of agriculture	78.642	66.5	112.27	68.0	72.991	68.1	74.701	59.8
Regulation of the market of agricultural products, raw materials and food	0.639	0.5	9.636	5.8	5.878	5.5	7.934	6.3
<b>Total</b>	<b>118.269</b>	<b>100.0</b>	<b>164.999</b>	<b>100.0</b>	<b>107.242</b>	<b>100.0</b>	<b>124.983</b>	<b>100.0</b>

Source: The Ministry of Agriculture of Russian Federation

<sup>15</sup> Annual exchange rate roubles per euro is (36.4 for 2008, 44.2 for 2009, 40.2 for 2010 and 40.9 for 2011).

As it can be seen, 8 indicators relate to “Improving competitiveness of Russian agricultural producers” goal and only one, i.e. the disposable resources of households in rural areas per household member per month, can be attributed to parameters characterizing to some extent, Sustainable development of rural areas. Similarly, sustainable rural development is associated with less than 8% of funding, while the rest of funding relates to improving competitiveness of Russian agricultural producers.

Thus, efforts are mainly focused on how to contribute to the development of agricultural production. The objectives of sustainable rural development are comprehensive and actually go beyond agricultural policy. They are stated in the State Federal Target Program “Social Development of Rural Areas till 2013” and include the improvement of living conditions of rural citizens, the development of social engineering and transport infrastructures (i.e. primary medical facilities, development of sport, education and culture, electricity, water and gas supply, telephone and telecommunication provision, road maintenance and construction). The State Program concentrates mainly on the improvement of living conditions and gas and water supply, for which relevant target indicators are set in the State Program. Other Ministries besides the Russian Ministry of Agriculture, which serves as main coordinator of the State Federal Target Program “Social Development of Rural Areas till 2013”, are responsible for this federal program. Funding of this State Federal Program requires co-finance from budgets of regions (republics) of the Russian Federation and additional off-budget private sources. The implementation mechanism is as follows: the Federal Budget provides non-repayable subsidies to the budgets of regions (republics) under the condition that the latter provide co-financing of the regional and (or) municipal programs relevant to the State Federal Program.

The environmental component – both in ensuring food security, as well as in agricultural production – is largely the task of further development, although the State has already taken certain measures, such as an obligatory assessment of the environmental impact of investment projects. The task of preservation of land resources is considered in the State program rather from the viewpoint of maintaining land for production purposes, than from the one of land preservation for recreation purposes or creation of reserves. Thus, measures on preservation of land and other natural resources in the State Program are included in the section “Provision for general conditions for agriculture”. These measures are implemented within the limits of Federal State Target Program “Preservation and Restoration of Soil Fertility of Agricultural Land and Agro-landscapes as National Heritage of Russia for the years 2006-2010 and for

the period till 2013”<sup>16</sup>. The set of measures in this Program are established to promote the application of fertilisers, to protect agricultural land from erosion and extraction from agriculture, and to involve land that suffered from Chernobyl catastrophe back to agriculture. All these measures clearly indicate the intention of authorities to maintain land mainly for production purposes. According to the federal law №264-FZ, Federal State Target Programs coordinated by the Ministry of Agriculture are considered as means of implementation of the State Program for the Development of Agriculture. Financing their measures is almost fully included in the funding of appropriate measures of the State program for the Development of Agriculture.

### *Practical implementation*

The main mechanism of farm support is to subsidise expenditures, with the most important being interest rate subsidies on the loans taken for specific goals. The goals are determined by the legislation acts. Other important measures are commodity-purchasing interventions, whose role has been enhanced, customs and tariff regulations, direct public investments and organisational measures (including consultations). Tax incentives, preferential tariffs, and the restructuring of debt in accordance with the Federal Law “On Financial Revitalisation of Agricultural Producers” are also implemented.

The regulatory support of the State Program includes:

- Governmental Resolutions of the Russian Federation which define methods of calculation and procedures for granting each kind of subsidies to regions of the Russian Federation<sup>17</sup>;
- Orders and Directions of the Ministry of Agriculture, specifying the particular provisions of the Government Resolutions;
- Annual Agreements signed between the Ministry of Agriculture and each region of the Russian Federation.

Regions adopt similar Regional State Programs and annually determine an order of distribution of subsidies between beneficiaries. Since 2009, regions of the Russian Federation can also determine federal rates on the range of subsidies within the limit allotted to the region from the federal budget. The list of such subsidies has been expanded in

<sup>16</sup> The Ministry of Agriculture of the Russian Federation, the Federal Agency of Water Resources, and the Russian Academy of Agricultural Sciences are in charge of implementation of this Program. The Ministry of Agriculture of the Russian Federation acts as coordinator.

<sup>17</sup> Usually corrected annually

2010<sup>18</sup>. Funding for the State Program is provided through the federal budget and budgets of regions on the terms of obligatory regional co-financing of almost all budgetary measures of the State Program. Without co-financing, regions cannot receive federal funds. Only a small number of measures (land improvement, veterinary service, and information service) are fully funded from the federal budget at the request of Russian regions. On a number of measures, obligatory co-financing from off-budget sources is required.

The funding of the State Program for the period 2008-2012<sup>19</sup> has been planned as follows: at the expense of federal budget, 551.3 billion roubles (38.6%), at the expense of regional budgets, 544.3 billion roubles (38.2%), at the expense of off-budget sources, 311 billion roubles (23.2%)<sup>20</sup>. Nevertheless, these figures have been considerably adjusted each year in the process of adoption of budgets for the next fiscal year. The principle of obligatory co-financing drives budgetary funds of regions on the implementation of the measures of the Federal State Program. Since 2009 levels of regional co-financing are determined by the Ministry of Agriculture for each region of the Russian Federation, depending on the levels of their fiscal capacity defined by the Ministry of Finance on an annual basis. Subsidised regions must co-invest less of their funds if compared with the donor-regions (mainly oil and gas producing). The distribution of limits on federal subsidies between regions is performed taking into account the level of the estimated fiscal capacity of the regions for the next fiscal year, according to procedures approved by Resolutions of the Government of the Russian Federation for each type of support. Since 2012, such a distribution will be approved by the Government of the Russian Federation. The Ministry of Agriculture redistributes limits of subsidies at least twice per year from regions that do not meet the requirements of co-financing or cannot use subsidies in full volume to those that have unsatisfied demand and opportunities to use extra-subsidies. This in turn requires changes in the regional co-financing, approved by regional legislation acts.

State Program funding constitutes more than 80 % of all funds allocated to the Ministry of Agriculture from the federal budget. It thus includes all the most significant and important measures of the federal level, aimed at sector development. Beyond the State Program there are a number of support measures of agricultural producers: regulation of prices and mark-ups, measures accepted to mitigate extreme weather conditions of individual years<sup>21</sup>, support for different agricultural products (milk, meat, etc.) and other measures

of support initiated and funded exclusively at the level of regions of the Russian Federation. Also, the budget of the State Program for 2008-2012 does not include the following issues: funds to maintain the Ministry of Agriculture of the Russian Federation and its subordinate agencies<sup>22</sup>, non-program investments and financing of federal programs for which the Ministry of Agriculture is not the main coordinator, but one of the participants.

The main item of expenditures of the State Program is interest rate subsidies on target loans. This subsidy implies long-term obligations of the State for 8-10 years for long-term loans and up to 3 years for prolonged short-term loans that require considerable budget expenses. For example, in 2010 it was paid 68.8 billion roubles from the federal budget and 12 billion roubles from regional budgets under this expenditure item. These subsidies will remain in the new State Program for the period 2013-2020. The prolongation of lending period and expansion of goals of subsidised loans (mainly from the side of processors and infrastructure developers) are strongly supported. For example, since January 2010 organisations engaged in storage and handling of grain and oilseeds can apply for interest rate subsidies under credit contracts on building, reconstruction and modernisation of the facilities for storage and handling of grain and oilseeds and acquisition of the equipment for these purposes for the term up to 10 years.

Since 2010 the Ministry of Agriculture has introduced a competitive selection of investment projects that applied for subsidised interest rate loans in order to better manage their expenses on this type of subsidy. In general, for the period 2013-2020, it is planned to allocate 576 billion roubles for these subsidies from the federal budget<sup>23</sup>. In 2008-2011 a State Program section on Market regulation has been strengthened at the expense of an increase in funding operations to carry out purchases and commodity interventions in the grain market. This has been the result of an increased awareness of problems that the country have encountered in a period of high grain yields (2008) combined with a shortage of storage capacities<sup>24</sup>, and in 2010, when a large-scale drought caused a reduction in total yields by 37% compared to 2009. The overall level of funding of the State Program in 2011 remained about the same as in the beginning of its entering into force in 2008. The sharp decline of its funding in 2010 was due to budget sequestration because of the global financial crisis.

In the projected State Program for 2013-2020, it is expected that its structure will be revised with respect to the current Program, while preserving and extending to some extent the

18 The Ministry of Agriculture of the Russian Federation also signs the Agreements on Cooperation in implementing of the objectives and tasks of the State program with the industry associations, "Rosselkhozbank", "RosAgroLeasing" and Russian Academy of Agricultural Science.

19 In edition of Government Resolution №446 from 7/14/2007

20 For off-budget sources - total for 2008-2010

21 For example, 35 billion of roubles (approximately 87 million euro) were allocated from federal budget to regional budgets to compensate the agricultural producers for the consequences of severe drought in 2010.

22 In the State program for 2013-2020 these expenses are included

23 Without subsidies for small business

24 The overall storage capacity in the country was estimated at 118.3 mln. tons while the grain yield in that year was 108.2 mln. tons besides stocks at the beginning of the year - 43.3 mln. ton



range of support instruments. Sections of the State Program will include:

- Development of crop production, its processing and marketing;
- Development of livestock production, its processing and marketing;
- Support for small businesses;
- Technical and technological modernisation, innovation development;
- Scientific provision for implementation of the State Program;
- Provision for implementation of the State Program;
- State Federal Target Program “Social Development of Rural Areas till 2013”;
- Support of complex compact building development of rural areas;
- State Federal Target Program “Sustainable Development of Rural Areas for the years 2014-2017 and for the period till 2020”;

- State Federal Target Program “Improvement of Agricultural Land of Russia for the period till 2020”.

In the new structure, the links of technological chain “agricultural producers-processors-infrastructure” in livestock rearing and crop production will be strengthened. The new State Program will include expenses for the maintenance of the Russian Ministry of Agriculture and its subordinated structures (section Provision for implementation of State Program) and funding for fundamental research of Russian Academy of Agricultural Sciences and innovative scientific agricultural projects (in the section “Scientific provision for implementation of State Program”), which were not there in the old Program. In general, the number of measures increased significantly in the projected State Program. This complicates its structure and monitoring.

#### *The Level of State Support: the regional role*

The level of support to agricultural producers from federal and regional budgets is extracted from the form RF-10-APC-region of the Ministry of Agriculture. It includes not only measures of the State Program, but also specific regional supports. Table 6 presents the level of State support per 1 rouble of gross agricultural production for the years 2006-2010.

	2006	2007	2008	2009	2010
Subsidies from consolidated budgets per 1 rub of agricultural production, kopecks <sup>25</sup>	3.9	4.8	6.4	7.0	7.7
Incl:					
From the federal budget	1.5	2.2	3.2	4.1	3.9
From the regional budget	2.5	2.7	3.2	2.9	3.9
Share of regions, %	62.9	55.2	49.7	41.9	50.2

Source: calculation according to the data of the Ministry of Agriculture of the Russian Federation and Rosstat

<sup>25</sup> 1 rouble = 100 kopecks; Annual exchange rate roubles per euro is (34.1 for 2006; 35.0 for 2007; 36.4 for 2008, 44.2 for 2009, 40.2 for 2010 and 40.9 for 2011).

As shown in Table 6, in 2006, subsidies amounted to almost 4 kopecks for 1 rouble of gross agricultural output. The share of subsidies in the value of gross agricultural output (GAO) has doubled over the period 2006-2010, but still remains low on average. The role of regional support is no less important than the federal one. Further, regional differences in the levels of support are significant. For example, in 2010 the level of consolidated support in the value of agricultural production ranged from 116 kopecks per rouble of GAO in Chukotka to 0.57 kopecks per rouble of GAO in Kostroma. At the same time the federal distribution of subsidies is smoother, as their distribution is based on the regional share of the areas under particular crops, the number of supported livestock inventories, on the relative size of the loans, etc.

Also, it takes into account the fiscal capacity of the regions and their activity. For example, support for economically significant regional programs was received by regions that have applied to the competition in the Ministry of Agriculture of Russian Federation and co-financed them. Rich regions are able to allocate more funds to develop its agricultural sector (Yakutia - 25 kopecks per roubles of agricultural production, Tyumen region - 12 kopecks). However, in such regions the return on investment is lower since there are mainly regions with less favourable weather conditions. In the main producing regions the level of regional support is low (Krasnodar - 0.58 kopeck, Stavropol - 1.33 kopecks). In Tables 7 and 8 the levels of State support per hectare of agricultural land and rural resident are given.

**Table 7: Level of State support per hectare of agricultural land in the Russian Federation**

	2006	2007	2008	2009	2010
Subsidies from consolidated budgets per ha of agricultural land, roubles	322	491	823	926	1063
Incl:					
From the federal budget	120	220	414	538	529
From the regional budget	202	271	409	388	534

Source: calculation according to the data of the Ministry of Agriculture of the Russian Federation and Rosstat

**Table 8. - Level of State support per rural resident in Russian Federation**

	2006	2007	2008	2009	2010
Subsidies from consolidated budgets per rural resident, roubles	1,588	2,435	4,112	4,621	5,307
Incl:					
From the federal budget	589	1,090	2,069	2,685	2,643
From the regional budget	999	1,345	2,042	1,936	2,664

Source: calculation according to the data of the Ministry of Agriculture of the Russian Federation and Rosstat

Following international practices, so as to compare the levels of State support for different countries, the OECD methodology is traditionally applied. It takes into account the following forms of support:

Budgetary support (transfers from the budgets of all levels for support of agricultural sector). This support may be provided directly to agricultural producers (direct budgetary support), or in the form of financing of favourable conditions for agricultural industry (funding of agrarian science, agricultural education, infrastructure etc.), - indirect budgetary support,

The support connected with a lost profit of the State (debt restructuring, tax incentives, etc.),

Transfers to agricultural producers related to tariff and customs regulations.

All this is taken into account in the OECD methodology for determining indicators of the Total Support Estimate (TSE), percentage TSE, as well as Producer Support Estimate (PSE) and Consumer Support Estimate (CSE). TSE is an annual cost of all transfers to producers and processors of agricultural products from taxpayers and consumers. Percentage TSE – the percentage of all transfers to agriculture as percentage

of GDP. PSE is a total cost of a transfer to agricultural producers. Percentage PSE - the total value of the transfer to agricultural producers, expressed in percentage of the total production cost in internal prices (OECD, 1998). Table 9 presents the levels of total support to agriculture of Russia, EU, U.S. and other countries from OECD data. As shown in Table 9, the level of total support in Russia in recent years was about 10 times lower if compared with the US, the EU and China. The share of total support in GDP shows rather the scarcity of the Russian budget, than it serves as a measure of real support of the sector. Besides, it should be taken into consideration that the share of agriculture in GDP in Russia is higher than in the US or the EU.

WTO classification requires the allocation of support measures to “boxes” on the basis of the main criteria: their “distorting” effect on trade and production. Measures included in the “Green Box” have, at most, minimal distortions. They are financed from the State budget and are not targeted on the maintenance of producer prices. “Green box” measures are exempt from the obligation of binding limits and any reduction. The State has the right to finance such measures in any desired volume. For this reason, there is a strong incentive to attribute as many measures of support to this box as possible<sup>26</sup>.

**Table 9: Levels of total support to agriculture of Russia, EU, U.S. and other countries**

	Average for 1995-1997	Average for 2008-2010	2010*
<b>Russia</b>			
Mln. USD	9,379	2,1684	18,295
% of GDP	2.6	1.6	1.4
<b>USA</b>			
Mln. USD	70,108	119,979	133,450
% of GDP	0.9	0.8	0.9
<b>EU<sup>27</sup></b>			
Mln. USD	131,531	134,677	116,245
% of GDP	1.5	0.8	0.7
<b>Canada</b>			
Mln. USD	5,024	9,482	10,539
% of GDP	0.8	0.6	0.7
<b>China</b>			
Mln. USD	13,020	119,078	177,238
% of GDP	1.5	2.3	3.0

Source: OECD, 2011. Note: \* preliminary estimates. Mln: Million.

<sup>26</sup> Similar financing rules apply to measures aimed at the restriction of excess production (“Blue box”). Expenses of this “box” should be allocated to fixed agricultural areas, fixed livestock inventory or volume of production. They also include payments made in respect of not more than 85 % of baseline production level. In Russia, these measures are not applied yet.

<sup>27</sup> For 1995-2003, 15 countries, since 2008, 27 countries.

The State must make a commitment to reduce budget funding for all other distorting measures ("Amber Box"). The maximum permissible level of support is calculated as the average annual actual expenses on "Amber box" measures for the last three years (base period). "Amber box" is calculated based on the values of aggregate measures of support for each agricultural commodity, which are then summed up. If the share of support for a particular product is less than 5 % of its annual production volume, it is not included in the Amber box. Between OECD and WTO classifications there are differences due to their different purposes, although they use similar definitions and take into account the same set of support measures, but using different approaches. The WTO's goal is to estimate trade-deforming measures, while the OECD's is to measure real support within the sector. The aggregated measure of support (AMS) estimated by WTO is much lower, than TSE and even PSE in OECD. A number of

measures, attributed by WTO to a "Green box", are included in PSE. The exact allocation of support measures to "boxes" is the task of experts, however, for rough estimations it is possible to take PSE for "an Amber" basket value, and general services support estimate for agriculture (GSSE)<sup>28</sup> as a "Green box" (Uzun et al., 2009). With this approach, the value of the "Amber box" appears overestimated, as a threshold of 5 % may not be achieved on a number of products and certain measures of a "Green box" can enter into the PSE. Table 10 gives approximate estimates of the "Amber" and "Green" boxes of Russian farm support for 2000 and 2010 based on this approach. For comparison, the same data are shown for the United States, although for this country a block "Transfers to consumers from taxpayers" is included in TSE, which is absent in Russia. In this case, measures of this block that are tied to specific products, we allocate to the "Amber box" and the rest of it - to a "Green".

**Table 10: "Amber" and "Green" "boxes" and their share in TSE in Russia and USA, million USD**

Indicators	Russia		USA			
			estimation with consumer support		estimation without consumer support	
	2000	2010	2000	2010	2000	2010
"Amber box" (PSE)	1,384	15,457	52,470	25,666	52,278	25,551
"Green box" (GSSE)	576	2,762	39,930	107,784	22,382	69,849
TSE total	1,960	18,218	92,399	133,450	74,659	95,400
Share of "Amber box" in TSE, %	70.6	84.8	56.8	19.2	70.0	26.8
Share of "Green box" in TSE, %	29.4	15.2	43.2	80.8	30.0	73.2

Source: calculation based on OECD data

28 GSSE – total annual transfers to private or public services that provided to agriculture generally (agrarian science, education, inspections, marketing, advertising, etc). Estimated by OECD.

Table 10 shows that, if in 2000 (without support of consumers) the ratios of the “Amber” and “Green” boxes in TSE of the U.S. and Russia were almost the same, then in 2010 the picture was very different. Russia has increased the “Amber” box, both in absolute and in relative terms, but the United States did exactly the opposite. For ten years now US ratios have dramatically decreased. Since Russia has entered the Custom Union with Kazakhstan and Belorussia and has joined the WTO, the necessity of changes of a similar order becomes imminent. Besides, a revision of relations between federal centre and regions is needed. Russia is a federal state and WTO requirements are imposed on the country as a whole<sup>29</sup>. This makes it necessary to consider not only federal measures, but also regional and local ones for evaluating Russia’s compliance with WTO requirements. Also, an urgent task has emerged to develop a mechanism of coordination between agrarian budgets of different levels under new conditions. There is currently no mechanism for determining how Russia intends to fulfil WTO commitments, when each region, and moreover, each municipality has the right to determine its agrarian budget and measures of support. Thus, Russia is in urgent need to:

- Identify the rights of authorities of different levels to determine and coordinate the set of measures and levels of support under new conditions;
- Develop and legislate the uniform classification of positions of local, regional and federal budgets for State support measures;
- Oblige the regions to notify federal authorities of any changes in support measures and their mechanisms as it is done by all WTO member countries with a federal structure.

#### *Access of Agricultural Producers to State support*

The main beneficiaries of the majority of State support measures are agricultural producers that meet the requirements specified in the rules for subsidy allocation. They are mainly agricultural organisations, as well as family farms and individual entrepreneurs. Processors, agricultural consumer cooperatives, household plots, young specialists and rural residents are also eligible for certain support measures. Though the State declares support of all forms and in the State Program for 2013-2020, a special section “Support for small business” is allocated; however, in practice, agricultural organisations, able of producing large volumes, are supported to a larger extent (Table 11).

**Table 11: State support measures in the year 2009**

	Total	Including		
		agricultural enterprises	family farms	household plots
1. Market value of sold agricultural products, billion roubles	1,305.1	875.6	98.1	331.5
2. Subsidies from consolidated budgets, billion roubles	164.1	120.0	12.6	31.6
Incl.				
subsidies attributed to production	132.0	110.4	10.6	11.0
subsidies for social development of rural areas and other	32.1	9.6	2.0	20.6
3. Subsidies from consolidated budgets per 1 rouble of market value of sold agricultural products, kopecks	12.6	13.7	12.8	9.5
Incl.				
subsidies attributed to production	10,1	12.6	10.8	3.3
subsidies for social development of rural areas and other	2.5	1.1	2.0	6.2

*Source: calculations on aggregate data of the Ministry of Agriculture*

<sup>29</sup> In particular in Annex 3 to the Agreement on Agriculture of WTO it is noted that measures of support both ON national and sub-national levels must be taken into account.

Household Plots that produce 43% of GAO (2011) have only access to subsidised interest rates on target loans. This is probably justified, because despite a significant share of GAO, the marketability of their output is rather low. For example, the largest share of household plots is specialised in the production of potatoes, i.e. 84% in 2010 (MOA, 2010b), but they only sell 17% of this volume (Rosstat, 2010a). Similarly, the share of household plots in the production of vegetables is 72% (MOA, 2010b), from which 16% is sold. By contrast, agricultural enterprises sell 83% of their production and family Farms 77% (Rosstat, 2010a). The marketability of livestock production is somewhat better. The marketability of livestock and poultry in live weight in household plots is 46%, while its share in gross production is 39% (MOA, 2010b). The share of household plots in milk production is 50% of total production, with marketability ratio of 31% (against 92% for agricultural enterprises and 60% for Family Farms) (MOA, 2010b).

According to the classification based on the All-Russian Census of Agriculture (2006) only 17% of all household plots could be considered as commercial as they have resources to produce the value of agricultural products of more than 30 thousand roubles (about 1,000 US dollars) a year that exceeds the demand for consumption of agricultural goods of the average family<sup>30</sup>. This means that they have production surpluses that they can sell. All other household plots do not have enough resources to produce surpluses for sale. Actually production subsidies should be allocated mainly to commercial household plots that already have the potential for further development. Social subsidies for sustainable rural development have to be substantially increased at the same time in order to maintain rural population and the attractiveness of rural living standards.

### 2.2.3. State policy for sustainable rural development

The basic principles and priorities of sustainable rural development in the Russian Federation have been set forth in the “Concept of sustainable development of rural territories till 2020”, approved in 2010. Sustainable development of rural territories (SDRT) was defined as “stable social and economic development, increasing volume of agricultural

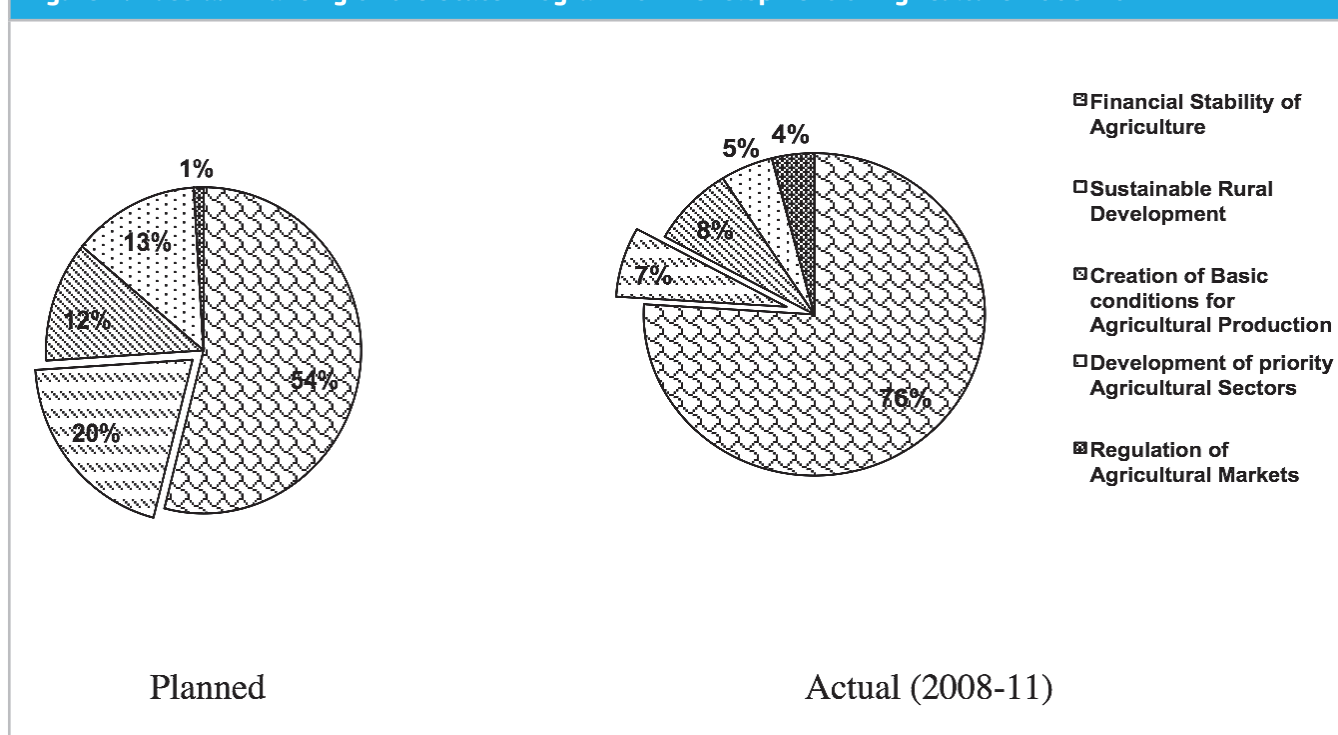
and fishery production, higher effectiveness of agriculture and forestry, secured employment and improving living standards of rural population and rational use of land”. Though the concept does not follow the production-oriented approach of the Soviet time, it still considers agricultural and fishery production as a priority and living standards of rural population are viewed only through the scope of employment and incomes.

The main priorities of sustainable rural development until 2020 are listed as follows:

- Creation of favourable social and economic conditions for rural areas as a source for rural amenities.
- Stable effectiveness of rural economy, especially agriculture and increasing its contribution to the well-being of Russian citizens.
- Higher employment rates and living standards of rural population, elimination of the gap between the living standards of rural and urban population.
- Slowdown of rural depopulation, stabilisation of the number of rural population and increase in life expectancy.
- Elimination of differences in living standards of rural population within one region and between regions.
- Rational use of natural resources and environmental protection.
- Preservation and development of rural cultures.

The State Program for the Development of Agriculture for 2008-2012 includes the following key sections: Financial Stability of Agriculture, Sustainable Development of Rural Territories (SDRT), and Creation of Basic Conditions for Agricultural Development, Development of Priority Agricultural Sectors and Regulation of Agricultural Markets (Figure 1). Despite the declared importance of the SDRT, the actual share of funding of this specific section of the State Program has reduced from 20% to 7% (Figure 1).

<sup>30</sup> Average size of the family in Russia is 2.7 persons. For a detailed methodology of classification and calculations see Uzun et al. (2011).

**Figure 1: Russia: Financing of the State Program for Development of Agriculture 2008-2012**


The effectiveness of the SDRT is evaluated through the analysis of changes in the rural population, employment, income, quality of life and migration processes. The number of rural inhabitants as of 1 January 2011 was 37.6

million including 23.6 of working-age people, the density of population was low - 2.3 persons per 1 sq. km. The share of rural population has been declining since the beginning of 2000: in 2001 - 27.1%, in 2010 - 26.9%, in 2011 - 26.3% (Table 12).

**Table 12: Changes in Rural Population, thousand persons**

Year	Population Start of the year	Annual change				Population End of the year
		Total increase	including:			
			Natural variation	Migration variation	Changes in territorial division	
2000	39,470	-238.7	-274.2	-2.6	38.1	39,231
2001	39,231	-307.9	-271.7	-51.9	15.7	38,924
2002	38,924	-281.6	-281.9	-26.7	27.0	38,642
2003	38,642	-292.6	-281.6	-34.7	23.7	38,349
2004	38,349	-405.1	-260.2	-28.6	693.9	38,754
2005	38,754	-106.2	-287.7	-22.6	204.1	38,648
2006	38,648	-206.1	-230.3	-28.1	52.3	38,442
2007	38,442	-206.8	-145.7	-9.1	-52.0	38,235
2008	8,235	-22.2	-113.3	-22.1	113.2	38,213
2009	38,213	-4.4	-88.9	-2.6	87.1	38,209
2010*	37,678	-190.0	-81.7	-90.9	-17.4	37,488

Source: Rosstat, 2010b

Rural population has decreased in all Federal Districts except the Northern Caucasus District (+2.1%), and the Southern District (+0.2%). The most significant natural decreases have been recorded in the Central (-9.1%), the North Western (-4.7%), the Ural (-4.7%) and the Northern District (-4.5%). The share of deserted settlements in the total amount of rural settlements has increased since the reforms started. As of January 1989, 9.4 thousand of rural settlements were deserted (5.8%), as of October 2002 - 13.1 thousand (8.4%), as of October 2010 - 19.4 thousand (12.7%).

The decrease in population per village is aggravating. The number of rural settlements with population less than 10 persons has increased - today they make almost a quarter of all the rural settlements (in 2002 - such rural settlements made one fifth part of the total). The smallest villages are situated in Central and Northern West Federal Districts. Their share in Yaroslavl, Vologda, Novgorod and Pskov Regions is over 40% (Table 13).

The rate of depopulation has been constantly increasing. Rural territories have lost 10.7 thousand of villages with permanent population within the period between the last two Censuses (1989 and 2002). One third of the rural settlements with population less than 100 persons do not have stationary

or mobile form of commodity delivery, consumer service infrastructure is practically dismantled. The problems of access to potable water, bad technical conditions of water supply systems are among the acute ones. The availability of telephone lines is 2.4 times less than in the urban districts. About one third of rural settlements have no access to roads with a firm covering.

Most of rural areas face a disturbing ecological situation, which stemmed from the over-exploitation of nature, the low technological potential of local economies, the lack of ecological education and fast immigration changes. Almost a quarter of agricultural lands including 30% of arable lands are heavily water- and wind-eroded. 50 thousand ha of agricultural lands are destroyed annually. Drains of cattle-breeding farms, systems of irrigation and drains from fields pollute water resources.

In 2010 the number of economically active people (i.e. aged 15-72) has decreased by 128 thousand and was 18.9 million. The reduction in the number of those employed in agriculture was not followed by the same reduction in rural population (Figure 2). The reduction in the level of employment<sup>31</sup> in rural areas was stopped in 2001 (Figure 3).

**Table 13: Number of Rural Settlements and Distribution of Population.**

	Total	Number of dwellers, persons				
		Without population	Less than 10	11-50	51-100	More than 101
2002						
Thousand	155.3	13.1	34.0	38.1	14.9	55.2
%	100.0	8.4	21.9	24.5	9.6	35.6
2010						
Thousand	153.1	19.4	36.2	21.4	9.0	33.3
%	100.0	12.7	23.6	21.4	9.0	33.3

Source: MOA, 2010a.

**Table 14: Migration of the population in rural areas (thousand people)**

	2009			2010		
	Arrivals	Departures	Migration	Arrivals	Departures	Migration
Migration - total	631.4	635.2	-3.8	609.5	705.5	-96.0
including:						
intra-Russian	546.6	628.2	-81.6	557.0	698.3	-141.3
international	84.8	7.0	77.8	52.4	7.1	45.3

Source: MOA, 2010a

31 This indicator does not include the Chechen Republic for the period 2000-2006.



Figure 2: Declining trend in Agricultural Employment (Rosstat)

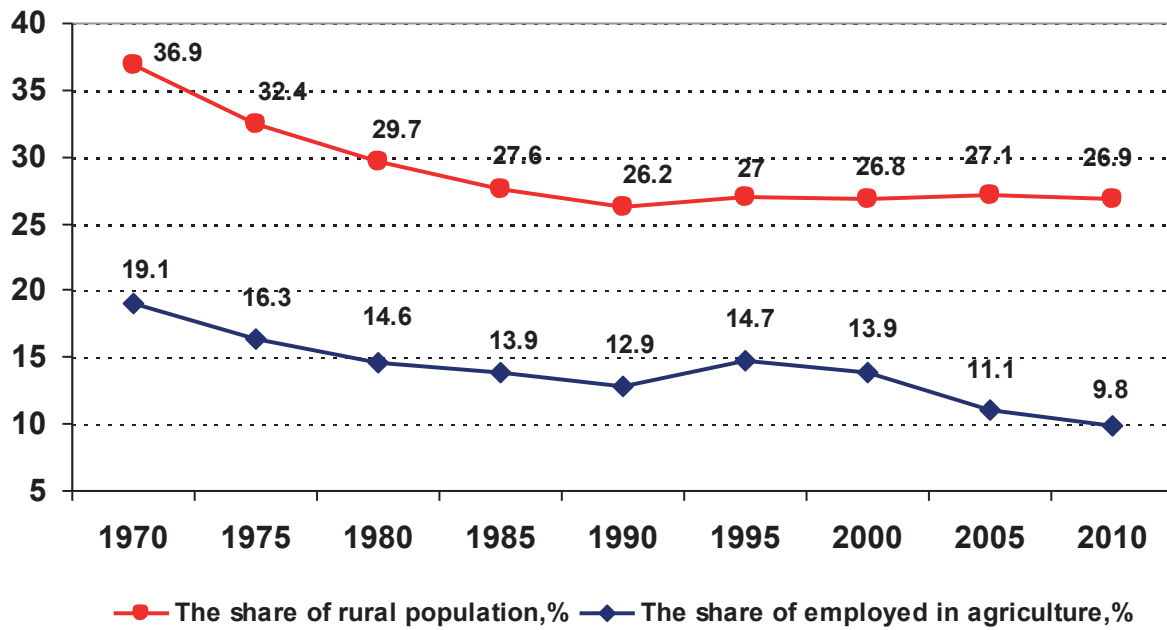
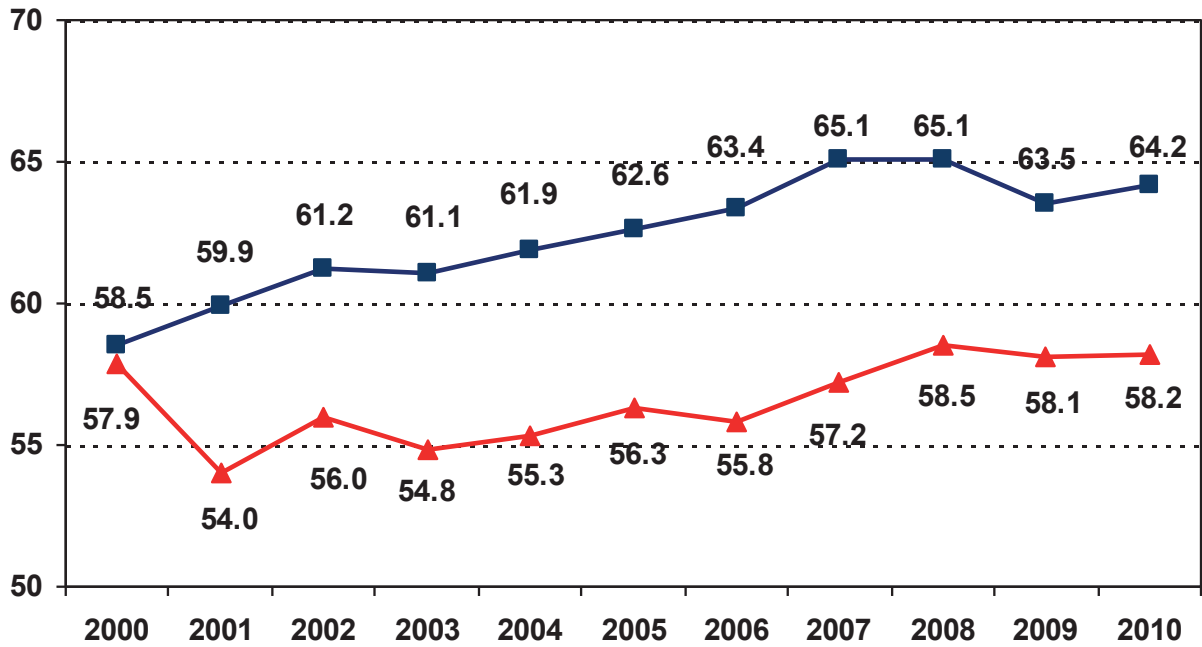


Figure 3: Employment for the population at age 15-72, %



The number of economically active rural people in 2010 has reduced in 6 Federal Districts, especially Northern Caucasus (Table 15). The rates of rural economy diversification have been rather low to create new jobs for rural residents, which have lost employment due to the modernisation of agricultural production systems (Table 16).

The average monthly salary has risen more rapidly in other sectors than in agriculture. In 2010 the difference between the average monthly salary in the economy and the average monthly salary in agriculture was 14%. Meanwhile, the share of monetary income in the available resources (monetary and in-kind payments) of rural households has increased (Table 17).

According to the macroeconomic indicators of poverty distribution in Russia, poverty levels have reduced by a factor of 2.3 over the last 10 years and reached 12.8 % in 2010. The number of people living below the poverty line has reduced from 42.3 to 18.1 mln. Therefore, the state policy for sustainable rural development includes measures to ensure employment, increased incomes and quality of life of the rural population, so as to slow down the process of depopulation, especially in the Non-Chernozem zone, Northern and Eastern regions. However, the actual financing of this section in the State Program was 3 times lower than previously planned; as a result, the objectives have not been met, rapid depopulation continues in many regions, the level of income in rural areas is 2 times less compared to the urban ones. The majority of poor Russians live in rural areas.

**Table 15: Grouping of Russian regions on employment of rural population at age 15-72, 2010**

Employment level, %	The number of Regions in Russian Federation	The name of the Regions in Russian Federation
Less than 50	5	Republics: Kabardino-Balkaria, Ingushetia, Tyva, Chechen Krai (Region): Zabaikalsky
50-55	12	Republics: Adygeya, Buryatia, Karachaevo-Cherkessia, Karelia Krai (Region): Primorsky Oblasts (Regions): Voronezh, Kemerovo, Kurgan, Penza, Ryazan, Ulyanovsk Autonomous region: Evreyskaya AO
55-60	34	Republics: Altay, Bashkortostan, Dagestan, Kalmykia, Komy, Sakha (Yakutia), Hakassia Krais (Regions): Krasnodar, Krasnoyarsk, Perm, Stavropol, Habarovsk Oblasts (Regions): Amur, Astrakhan, Arkhangelsk, Belgorod, Bryansk, Volgograd, Irkutsk, Kaliningrad, Kursk, Magadan, Nizhny Novgorod, Omsk, Orel, Pskov, Rostov, Samara, Sverdlovsk, Smolensk, Tambov, Tver, Tula Autonomous region: Nenets
More than 60	30	Republics: Marii El, Mordovia, Northern Ossetia-Alania, Tatarstan, Udmurtia, Chuvashia Krais (Regions): Altay, Kamchatka Oblasts (Regions): Vladimir, Vologda, Ivanovo, Kaluga, Kirov, Kostroma, Leningrad, Lipetsk, Moscow, Murmansk, Novgorod, Novosibirsk, Orenburg, Saratov, Sakhalin, Tomsk, Tyumen, Chelyabinsk, Yaroslavl Autonomous regions: Hanty-Mansy, Chukotka, Yamalo-Nenets

**Table 16: Structure of Rural Employment**

	2009		2010		Rank	2010 to 2009, %
	Th. pers.	%	Th. pers.	%		
Employed in rural economy, total	16,880	100	16,864	100		99.9
including:						
Agriculture, forestry, hunting and fishery	4,571	27.1	4,384	26.0	1	95.9
Mining operations	272	1.6	281	1.7	12	103.3
Processing industries	1,427	8.5	1,478	8.8	4	103.6
Production and distribution of electro-energy, water and gas	459	2.7	477	2.8	11	103.9
Construction	1,025	6.1	1,046	6.2	8	102.0
Trade, auto-repair, small consumer services, hotels, restaurants	2,192	13.0	2,198	13.0	2	100.3
Transport and communication	1,176	7.0	1,208	7.2	7	102.7
Finance and real estate	613	3.6	652	3.9	9	106.4
Government, pension and military service	1,446	8.6	1412	8.4	5	97.6
Education	1,910	11.3	1,930	11.4	3	101.0
Healthcare and provision of social services	1,258	7.5	1,242	7.4	6	98.7
Other types of economic activity	530	3.1	555	3.3	10	104.7

Source: MOA, 2010a

**Table 17: Structure of available resources for households (%)**

	All households 2010	Urban			Rural		
		2000	2009	2010	2000	2009	2010
Available resources	100	100	100	100	100	100	100
Including:							
Gross income	91.7	95.8	93.8	91.4	97.3	93.5	93.3
including:							
Monetary income	88.1	89.5	91.4	89.0	74.3	83.5	84.2
Value of products in kind (natural receipts)	3.6	6.3	2.4	2.4	23.0	10.0	9.1
Sum of loans and savings spent	8.3	4.2	6.2	8.6	2.7	6.5	6.7

#### 2.2.4. Incentives and constraints in the development of agriculture and rural areas

##### *Impact of subsidies on the profitability of agriculture*

The development of any industry is determined by its profitability: the higher its value, the stronger the incentive to expand. As can be seen from Table 18, subsidies have substantially increased profitability, thereby supporting

agricultural development. The impact of support has particularly increased in recent years. In fact, in a few regions the existence of agriculture would be impossible without subsidies. For example, in the Republic of Sakha (Yakutia) in the last 9 years agriculture was highly unprofitable without government support, i.e. without subsidies the profitability rate of agriculture in this Republic was largely negative, around - 45%, while subsidies allowed producing with marginally small profits.

**Table 18: Impact of subsidies on the profitability<sup>32</sup> of agriculture**

Profitability level	2005	2006	2007	2008	2009	2010
Without subsidies	2	2.6	7.9	2.2	-3.2	-5.4
With subsidies	7.6	9.7	16.7	14.8	9.4	8.3
Increase in profitability points due to subsidies	5.6	7.1	8.8	12.6	12.6	13.7

Source: MOA, 2011

**Impact of support on agricultural development: evidence from regression analysis**

We use of a linear regression model on regional data to assess the impact of State support on agricultural development. The average annual growth of gross agricultural production over the period 1998-2010 is chosen as a dependant variable characterizing the development of agriculture. The following explanatory variables are included in the initial set:

- the average annual value of State support from the consolidated budgets for the period 2006-2010;
- the annual investments in fixed capital of agriculture<sup>33</sup>;
- bioclimatic potential of the regions;
- profitability of agricultural production without subsidies<sup>34</sup>;
- Rural population (annual average for the period 1998-2010).

However, the variable “bioclimatic potential of the regions” has been excluded after calculating the coefficients of pairwise correlations due to the high correlation with the variable “rural population” and variable “annual investments in fixed capital of agriculture” has been excluded because of the high mutual correlation with State support.

The regression equation is presented below. All coefficients are statistically significant.

$$Y=277.90+0.022X_1+0.252X_2+14.690X_3(1)$$

Regression analysis statistics and results are shown in Tables 19 and 20. Thus, 82 % of the variation in the average annual growth of gross agricultural production over the period 1998-2010 is explained by variations of explanatory variables. The correlation coefficient is significant. Data on variance and regression analysis are presented in Table 20. The probability of the null hypothesis (p-level) is much smaller than 0.05, which proves the significance of the regression equation.

**Table 19: Regression statistics**

Ratio	Value
Multiple R	0.905
R-squared	0.819
Fisher’s criterion, F(3,73)	110.782
P-value	0.000
Standard error	638.361

Source: Author’s calculations

32 The ratio of before-tax profit to total costs of production in per cent.

33 Including hunting and forestry.

34 Calculated for agricultural enterprises.

Explanatory variables	$\beta$ -coefficients	Regression coefficients (a <sub>j</sub> )
Constant term		277.902** (117.284)
Rural population	0.599*** (0.063)	0.002*** (0.000)
Average annual value of State support	0.364*** (0.057)	0.252*** (0.039)
Average profitability	0.134** (0.055)	14.688** (6.043)

Source: Author's calculations. Notes: standard errors between parentheses. \*\*: significant at 5%, \*\*\* at 1%.

According to the estimated equation, the average annual increase in State support for 1 million roubles increases gross agricultural output by 0.252 million roubles. The increase in profitability of agricultural production of 1 per cent results in an increase in gross agricultural output of 14.69 million roubles. The increase in rural population by 1 person increases gross agricultural output by 2.2 thousand roubles. Furthermore, descriptive statistics and elasticity coefficients can be calculated based on this equation (Table 21). They show that an increase of rural population by 1 % resulted in the growth of agricultural output by 0.57 %. Similarly, an increase of State support by 1 per cent provides an increase in gross agricultural output by 0.23 %, and 1 % increment in profitability yields 0.05 % of increase of agricultural production.

As factors are given in different units,  $\beta$ -coefficients of explanatory variables are used for comparison of the

contribution of each factor<sup>35</sup>.  $\beta$ -coefficients allow ranging factors on the degree of their influence on the dependant variable. In our case, rural population has the largest influence, –followed respectively by the volume of State support and then profitability.

The factor share in their summarised impact can be estimated from the magnitude of delta-coefficients  $D(j)$  under the formula:

$$\Delta_j = r_{y,x_j} \beta_j / R^2$$

The share of the impact of rural population is 61.5 %, State support – 30.8 % and profitability – 7.7 %. Results are given in Table 21.

Explanatory variables	Average values	Elasticity coefficients	The share of the factor in the overall impact explained by independent variables, %
Rural population	494,093	0.57	61.48
Average annual value of State support	1,775	0.23	30.76
Average profitability	6.8	0.05	7.76

Source: Author's calculations

<sup>35</sup> According to their magnitude, it is possible to estimate the significance of independent variables, as  $\beta$ -coefficients show, of how many standard deviation units the dependant variable will change if the dependant variable changes of one standard deviation while fixing the remaining variables at constant level.

To sum up, State support has affected the growth of gross agricultural production in regions of the Russian Federation as the average annual increase in State support of 1 million roubles leads to an increase in gross agricultural output of 0.252 million roubles. Also, the growth of gross agricultural production has been significantly influenced by the number of rural people and to a lesser extent by the profitability of agricultural production. Results should be interpreted with extreme caution, as data are available for different time-periods and the profitability can only be calculated for agricultural enterprises, while gross agricultural output and subsidies are for all agricultural producers. Indeed, this preliminary analysis, which lacks of robustness/rigor, only serves an indicative purpose to reveal a key message on the extent of the importance of subsidies for Russian agricultural development. These intuitions are examined further with a more rigorous survey analysis.

### Survey analysis on the impact of farm support

The influence of state support on the business environment in agriculture can be assessed on the basis of sociological surveys of the implementation of the State Program, conducted in 2009 in 30 regions of Russia. Heads of agricultural organisations, both participating, and not participating in the State Program have been interviewed. In particular, the study includes questions about the relevance of measures of the State Program to the current situation, as well as their impact on agricultural development within the rayon.

Table 22 shows that non-participants have given a more negative assessment of the State Program than participants. In general, State Program measures have been positively rated by 67% of participants and 52% of non-participants. Over a quarter of the participants and 36% of non-participants have given a negative evaluation, among which, approximately 10% of respondents (within each group) have a very bad opinion of the program. Also, the survey has revealed regional disparities. The highest percentage of participants with the most negative assessment of State Program measures is concentrated in the Orenburg region (28 %), the Stavropol Kray (26 %) and the Moscow region, 16% of the total number of interviewed participants. The highest percentage of the most positive answers (i.e. believed that the measures of the State Program was fully adequate to the situation) is found in Kalmykia (35 % of participants), Bashkortostan (33 %), Krasnodar and Penza regions (28 %), Kurgan region (26 %) and Voronezh region (25 %) of the total number of interviewed participants in these regions. To some extent these differences can be explained by traditional more loyal attitudes towards authorities from producers of national republics of Bashkortostan and Kalmykia. The highest share of non-participants with the most negative opinions are in Sverdlovsk region (50 %), Stavropol Kray (44 %), and Moscow region, 35 % of the total interviewed non-participants of these regions.

**Table 22: Opinions of the respondents on the State Program measures (2009)**

Options of responses	Participants		Non-Participants	
	number of replies	% of the total	number of replies	% of the total
Positively, its measures are adequate to a current situation	297	13	24	4
Positive as a whole, but a number of measures should be added or corrected	1,209	54	274	48
Tend to negative as only a number of measures meet the requirements of the development of agriculture, the others should be changed	405	18	130	23
Negatively, measures as a whole do not meet the requirements of the development of agriculture, the program should be totally revised	174	8	77	13
I find it difficult to answer	145	7	68	12
<b>Total</b>	<b>2,230</b>	<b>100</b>	<b>573</b>	<b>100</b>

Source: Author's calculations

On the question concerning the influence of the State Program on the rayon's agricultural development, where the surveyed agricultural enterprise is located, the opinions of respondents have been as displayed in Table 23. Table 23 confirms the previously expressed opinion that non-participants have assessed the State Program measures more negatively than actual participants. However, it should be noted that 54 % of participants believe that the State Program measures has insignificant or no impact at all on the agricultural development of their rayon. This can be interpreted as a serious signal for the officials to make changes in program measures.

Furthermore, the business environment in agriculture can be understood by the intention of the respondents to develop their future activities. To the question "What are you going to do with your agricultural enterprise in the nearest 2-3 years?" answers are shown in Table 24. It seems that the majority of participants and non-participants aim at keeping their current size. Only 0.9% of the participants and 4% of non-participants have wanted to liquidate their enterprise. Thus, the business environment can be evaluated as relatively favourable.

**Table 23: Distribution of responses regarding the impact of the State Program (2009)**

Options of responses	Participants		Non-Participants	
	number of replies	% total	number of replies	% total
Significant influence	752	34	60	11
Insignificant influence	981	44	305	53
No impact at all	221	10	140	24
I find it difficult to answer	276	12	68	12
<b>Total</b>	<b>2,230</b>	<b>100</b>	<b>573</b>	<b>100</b>

Source: Author's calculations

**Table 24: Distribution of responses of the heads of agricultural enterprises**

Options of responses	Survey of the year 2009			
	Participants		Non-Participants	
	number of replies	% of the total	number of replies	% of the total
To expand	656	29.4	120	20.9
To keep in the former size	1,341	60.1	340	59.3
To reduce	51	2.3	37	6.5
To liquidate	20	0.9	23	4.0
I find it difficult to answer	162	7.3	53	9.2
<b>Total</b>	<b>2,230</b>	<b>100</b>	<b>573</b>	<b>100</b>

Source: Author's calculations

## 2.3. Changes in the farming structure

Sections 2.1 and 2.2 have described the numerous reforms that have affected the agricultural sector on multiple levels, the current agricultural policy, and have also given some intuitions and insights on how those may have impacted farmers. To formally understand how the agricultural sector has been affected, this section especially describes the characteristics of several categories of agricultural producers that are identified by official Russian statistics (i.e. agricultural enterprises, family farms, household plots). The analysis of the development of each category, including changes in their role in total production and input use, the concentration of production in large agricultural enterprises, the creation of agricultural holdings and consumer cooperatives and family farms are presented in this section. Using data from the Census of Agriculture, this section goes further than official statistics traditionally available in Russia by extending and identifying a new and unique economic classification of agricultural producers.

### 2.3.1. Categories of agricultural producers

Traditionally all agricultural producers in Russia have been divided into three main categories on which the Russian Statistical Agency (Rosstat) gathers and publishes data:

agricultural enterprises – '*selskohoziastvennyye predpriyatiya*' (large farms)

peasant (farmer) operators – '*krestyanskie (fermerskie) hoziaystva*' (family farms) and individual entrepreneurs in agriculture;

Household plots – '*lichnye podsobnyye hoziaystva*'.

First, agricultural enterprises are legal organisations. According to the civil Code of the Russian Federation, they consist of different legal forms: state and municipal

enterprises, share holding companies, societies with limited liability, commandite societies, and agricultural production cooperatives. According to the Law on Small and Medium Entrepreneurship, agricultural enterprises are divided into micro-enterprises (less than 15 employers and less than 60 million roubles of receipts without VAT), small enterprises (less than 100 employers and less than 400 million roubles of receipts without VAT), medium (less than 250 employers and less than 1 billion roubles of receipts without VAT). Other agricultural enterprises belong to the class of large farms. Second, peasant (farmer) operators or Family Farms (FF), are created and registered according to the Law on Peasant (Farmer) Holding. They can be registered with or without status of legal body. Individual entrepreneurs (IE) are citizens involved in agricultural production registered as individual entrepreneurs. Ratios on individual entrepreneurship in agriculture are typically associated to peasant (farmer) operators in most cases. Third, household plots consist of two main types:

Private households of population (PHP) have family and/or individual production on personal plots. They might have also field plots. They are created and registered according to the Law on Private Subsidiary Plots. Members of household plots at working age have a basic off-farm employment.

Fruits and vegetable gardening, dachas (summer cottages) are intended for recreational purposes, but are involved in agricultural production in most cases, primarily fruits and vegetables, potato and berries production. They are part of non-commercial organisations. They are created and registered according to the Law on Fruits and Vegetable Gardening, Dachas, Non-commercial Associations of Citizens.

The number and size of farms of different types and classes is shown in Table 25. There is also a division within agricultural producers into two groups within the economic literature, i.e. corporative farms and family households. Farms are traditionally categorised on the base of their legal forms, rather than on the base of their volume of production and available inputs.



<b>Table 25 Number and size of farms</b>				
	Number of farms thousand	Agricultural area		
		Total, mln. ha	%	Per farm, ha
1. Agricultural enterprises	59.2	133.9	79.9	2,261.8
Including large and medium	27.8	107.4	64.1	3,861.9
small	20.4	24.5	14.6	1,202.3
subsidiary	11.0	2.0	1.2	183.0
2. FF and IE	285.1	24.1	14.4	84.7
Including FF	253.1	21.6	12.9	85.3
IE	32.0	2.6	1.5	79.8
3. Household Plots	36,593.8	9.6	5.7	0.3
Including private household plots	22,799.4	8.8	5.2	0.4
Gardening and dachas	13,794.4	0.8	0.5	0.1
<b>Total</b>	<b>36,938.1</b>	<b>167.6</b>	<b>100</b>	<b>4.5</b>

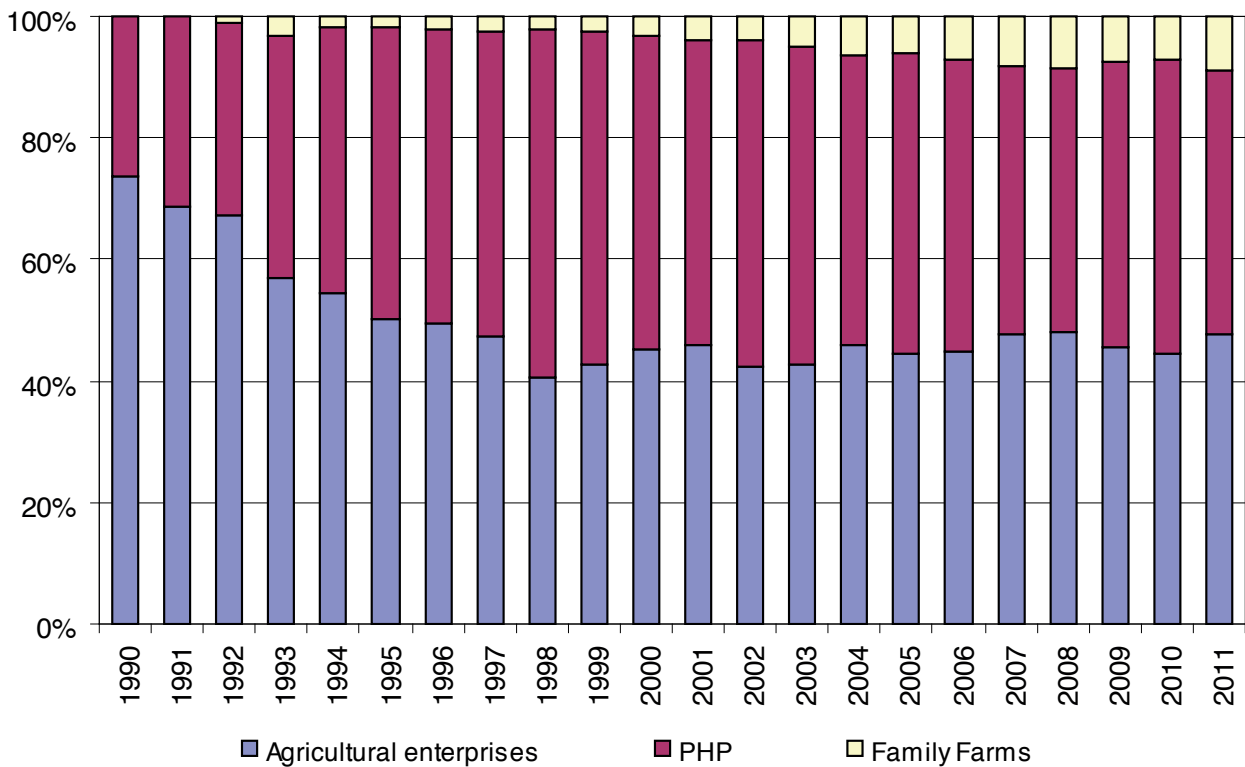
Source: MOA, 2007

### 2.3.2. Role of agricultural producers in Russian agriculture

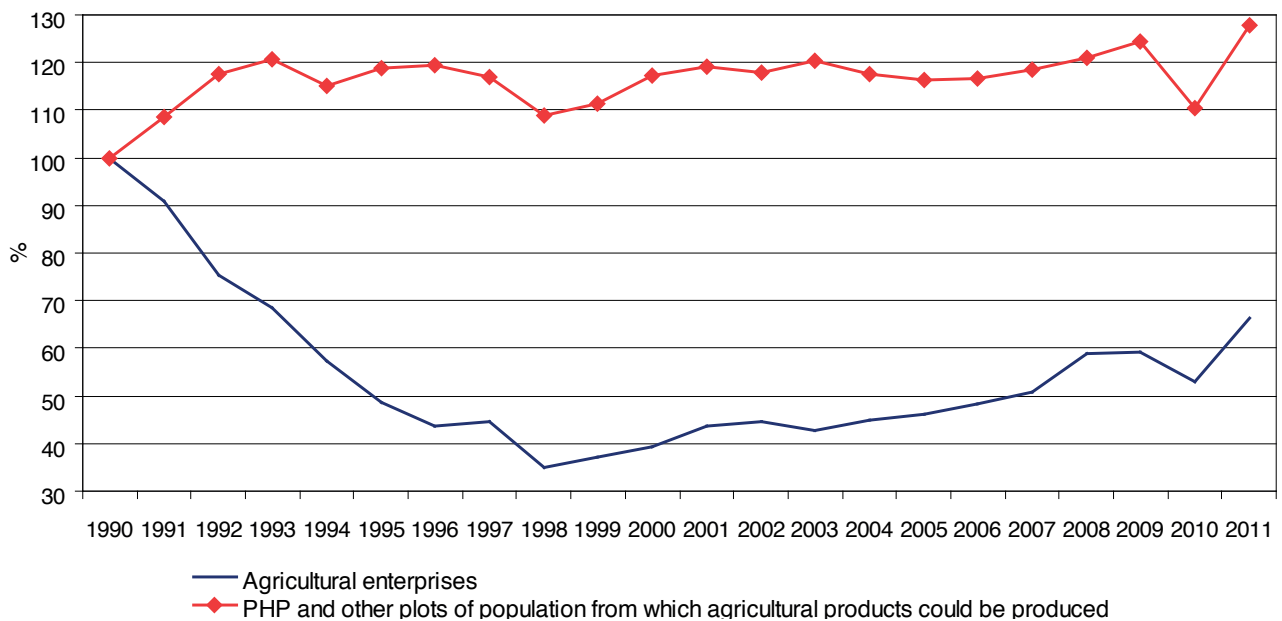
The agrarian structure in Russia has radically changed over the reform period. Before the reform, in 1990, the main share of gross agricultural output (73.7%) was produced by large agricultural organisations (i.e. collective and state farms, agro-firms). Household plots produced 26.3% of GAO. The share of agricultural organisations during the reforming period sharply declined to 40.4 % (1998), and then slightly increased (47.7 % in 2011). In contrast, the family farm sector that has arisen in the beginning of 90ies has been developing ever since. Its share in GAO has been steadily increasing and was 8.9 % in 2011 (Figure 4).

The share of family households has rapidly increased in the first years of reforms to reach 57.4% in 1998. Then it has reduced to 43.4%. It was originally expected in the beginning of the reforms that private ownership might cause the creation of Western-type family farms in Russia. This has not happened, as only 5% of rural residents have organised their own family farms, while others have preferred to stay as traditional household plots. Sharp changes in the shares of agricultural output between different types have happened due to a fast decline of the production in agricultural organisations. This decline has been partially compensated by the increase in household plots (FF and IE plus household plots) (Figure 5).

**Figure 4: Share of different types of producers in gross agricultural output**



**Figure 5: Indices of physical volume of agricultural production (%)**



While family farms produce the main share of agricultural output, yet their marketability, especially at household plots, is very low. This is why the role of agricultural producers of different types in gross agricultural output and marketed output is not the same. The main share of marketed output is provided by agricultural organisations (Table 26). There is no systematically arranged data in Russian statistics on the

value of marketed output (coming from farmer's receipts) by agricultural producers of different types. It has only been done once in the framework of the National project "Development of Agro-Industrial Complex in Russia". The role of agricultural producers of different types has changed over the period not only in terms of GAO but also with respect to specific products. Grain, beetroots and sunflower are mainly

produced in large farms. However, the increasing importance of FF is also evident from Figures 6, 7 and 8. In recent years, the share of FF in production of sunflower has exceeded 25%, in grain production output - 20% and in production of sugar beet - 10%. The share of household plots in production output of these products is negligible. Similarly, the main producers of potato are household plots though the share of family farms has clearly risen over the last 5-7 years

(Figures 9-10). Approximately 80% of produced volumes of potatoes and 75% of vegetables are produced by household plots. Before the reform, 70% of vegetables were produced by the agricultural enterprises, but in recent years, their share has been less than 20%. Family Farms are increasing the production of vegetables. Their share in gross production of vegetables has increased and exceeds 10%.

**Table 26: The share of agricultural producers of different types in marketed agricultural output**

	2006	2007	2008	2009
The value of marketed output in farms of all categories, billion roubles	792	1,012	1,217	1,305
Agricultural organisations	512	673	812	876
FF and IE	64	89	103	98
PHP	216	250	302	331
In %:				
Agricultural organisations	64.7	66.5	66.7	67.1
FF and IE	8.1	8.8	8.4	7.5
PHP	27.2	24.7	24.8	25.4

Source: Rosstat, form 21-sh

Figure 6: Share of agricultural producers in grain production

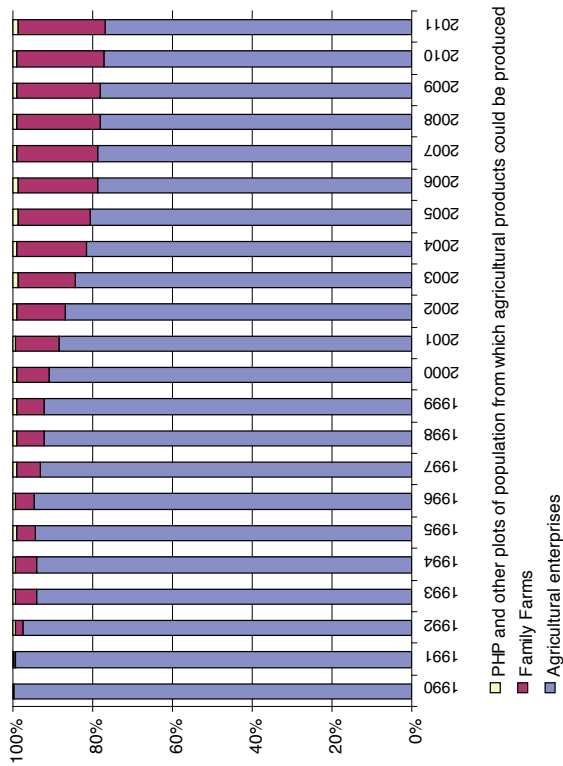


Figure 7: Share of agricultural producers in beetroots production

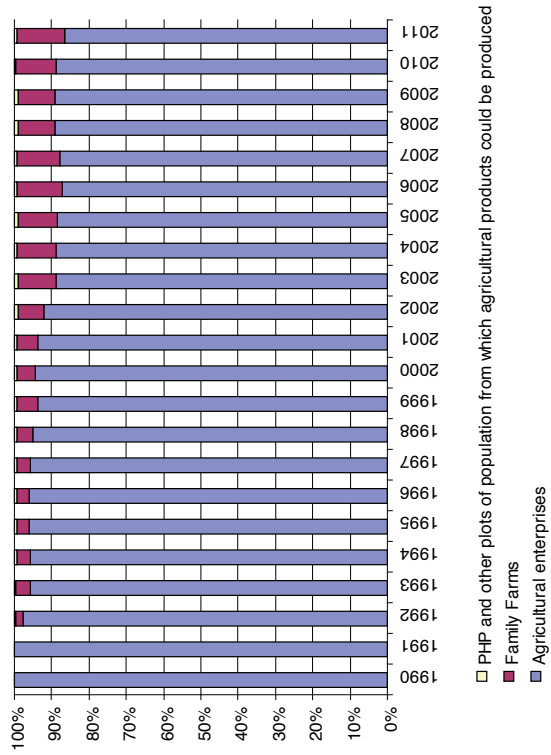


Figure 8: Share of agricultural producers in sunflower production

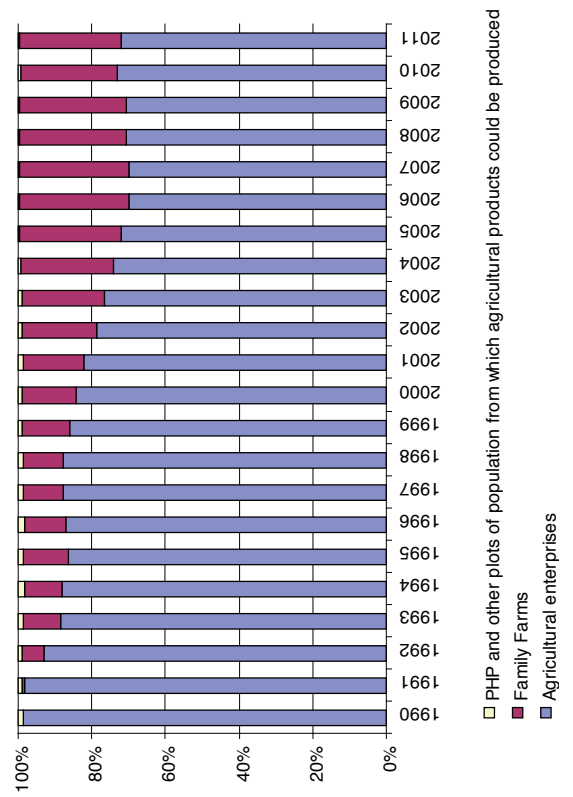


Figure 9: Share of agricultural producers in potato production

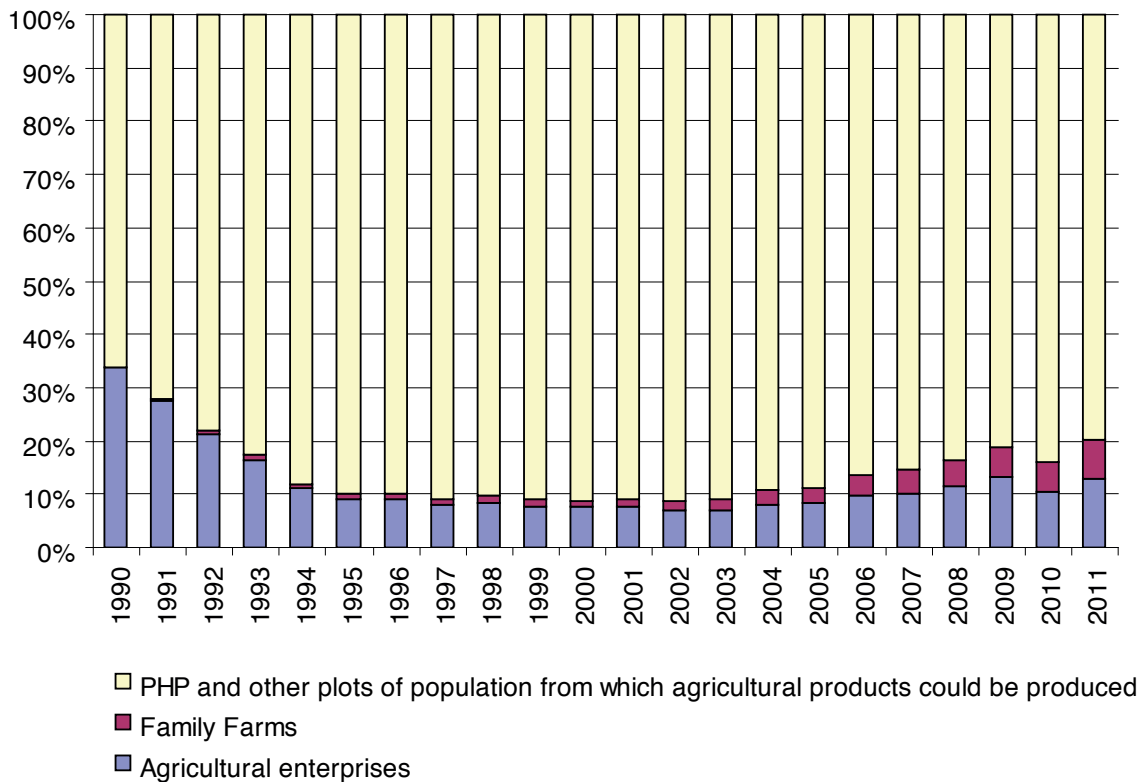
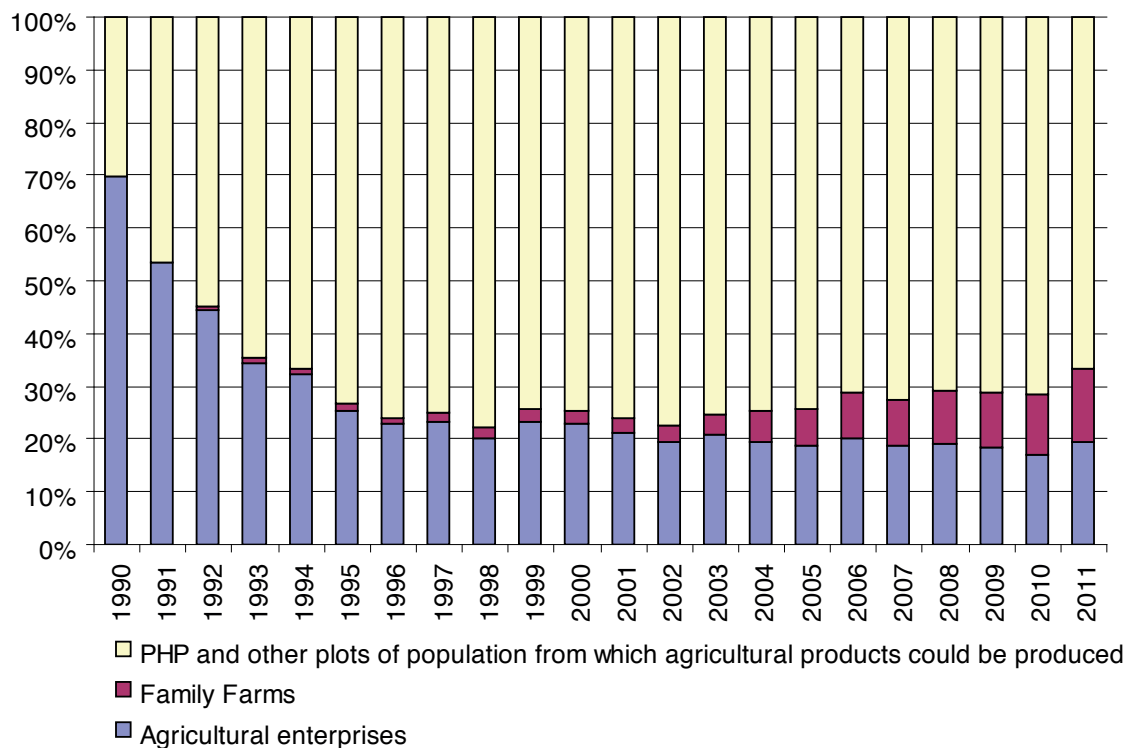


Figure 10: Share of agricultural producers in vegetable production



Also, a specialisation is clearly observed in crop production: labour-intensive crops (potatoes, vegetables) that are cultivated on relatively small plots are produced mainly by household plots, while cereals and industrial crops that require high level of mechanisation and occupy large areas are produced mainly by agricultural organisations and FF. In livestock rearing, a definite specialisation of different categories of agricultural producers is also developed (Figures 11-14). For example, poultry production (eggs and poultry meat) is produced mainly by agricultural organisations, while wool and mutton are produced mainly by household plots and FF. The share of FF in sheep-breeding production output has grown rapidly in recent years and exceeded the share of agricultural enterprises (for wool in Figure 14). The share of agricultural enterprises in dairy production has gradually decreased in the early years of the reform, while the share of household plots and FF has grown.

In recent years, the ratio between these categories of producers in dairy production output has stabilised at a level 1:1. The role of agricultural enterprises in meat and poultry production in the early years of the reform has fallen sharply (from 75% in 1990 to 40% in 1999). In subsequent years, agricultural enterprises have steadily increased the production of poultry and pork and have become the main producers of meat once again. Furthermore, there have been variations in input use across agricultural operators. Both the size of agricultural plots and the number of workers have decreased in agricultural enterprises while they have increased in family farms and household plots (Table 27). In 1990, both household plots and FF shares were less than 2 %, and in 2010 they amounted to 36 %. Similarly, the share of employed and self-employed in FF and household plots has increased from 17 to 74.6 %.

**Table 27: Input use by the agricultural producers of different types**

	Year	Total	including			PHP and FF, %
			Agricultural organisations	household plots	Family farms	
Agricultural land, mln.ha	1990	213.8	209.8	3.9	0.1	1,9
	1995	209.6	171.2	28.0	10.4	18,3
	2000	197.0	157.6	24.9	14.5	20,0
	2005	191.7	137.9	33.1	20.7	28,1
	2010	190.8	122.1	46.7	22.0	36,0
Number of employees in agriculture, mln. persons	1990	10.0	8.3		1.7	17.0
	1995	9.7*	6.7		3.0	30.9
	2000	9.0*	4.6**		4.4	48.8
	2005	7.4*	2.6**		4.8	64.9
	2010	6.7*	1.7**		5.0	74.6

Note: \* Total employment in agriculture and forestry. \*\* According the aggregate reports of agricultural organisations. Source: Rosreestr, Rosstat (2005- 2011).

Figure 11: Share of agricultural producers in meat and poultry production

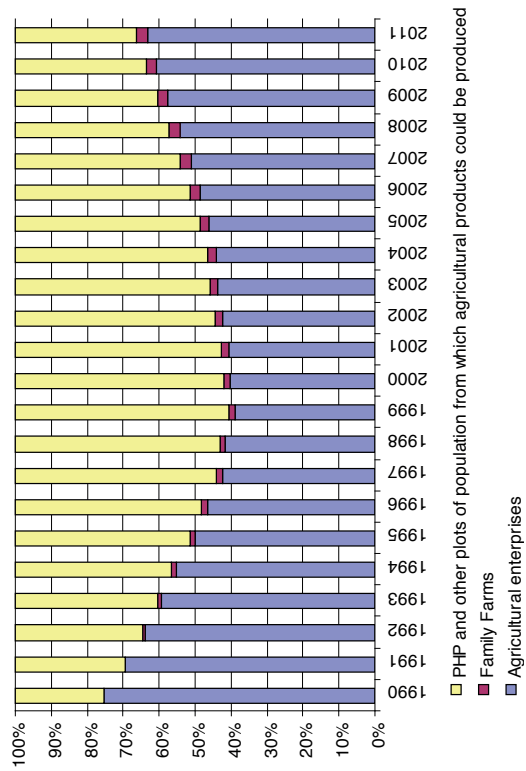


Figure 12: Share of agricultural producers in dairy production

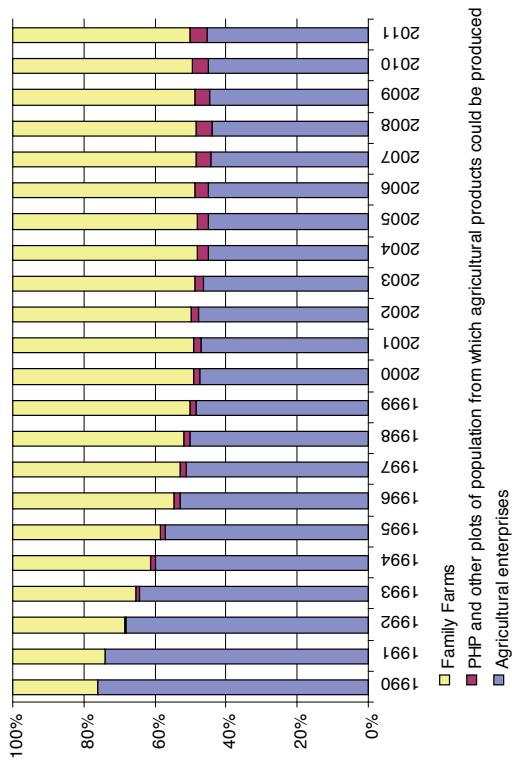


Figure 13: Share of agricultural producers in egg production

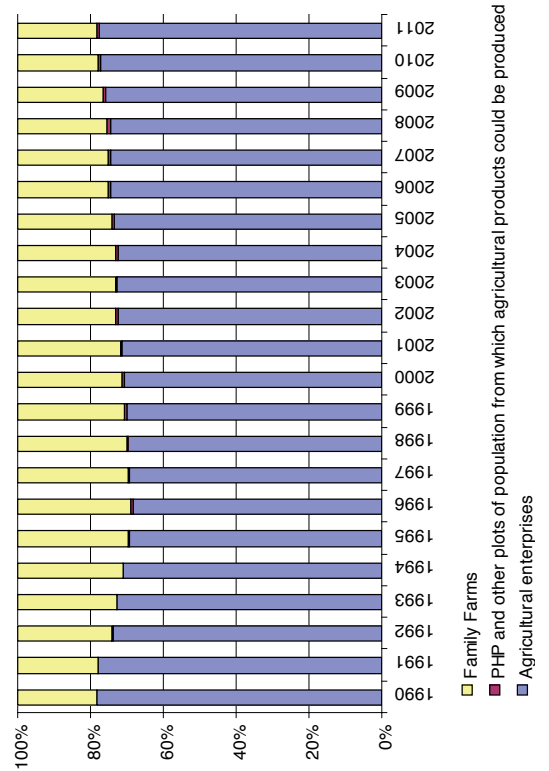
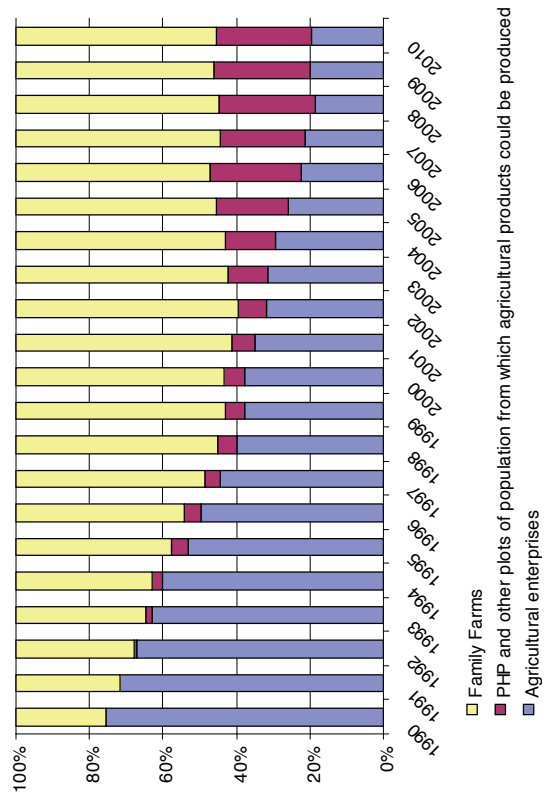


Figure 14: Share of agricultural producers in wool production



The agrarian structure across regions was relatively homogenous before the implementation of reforms. It has dramatically changed since. Some regions have kept the corporative type of agrarian structure with prevailing agricultural organisations in GAO (greater than 50 %). On the contrary, in a number of other regions, the importance of agricultural organisations has faded, and FF and household plots have begun to provide more than 70% of gross

agricultural output, i.e. the family type of agrarian structure has arisen. The mixed type of agrarian structure where agricultural organisations make up a share greater than 30 % and less than 50 %, family households greater than 50 % and less 70 %, developed in the third regions. The grouping of regions according to the agrarian structure can be found Table 28.

<b>Table 28: Grouping of Russian Federation regions according to the agrarian structure</b>				
	Total in Russia	Including regions with different agrarian structure type		
		corporative	mixed	family
<b>2000</b>				
Number of regions	77	18	42	17
%	100	23.4	54.5	22.1
Value of gross agricultural output:				
In current prices, bln. roubles	742	262	405	75
%	100	35.3	54.5	10.2
Share in GAO, %				
Agricultural organisations	45.2	56.1	42.3	23.1
Family farms	3.2	3.3	3	4.1
Household Plots	51.6	40.7	54.8	72.1
<b>2005</b>				
Number of Regions	78	22	40	16
%	100	28.2	51.3	20.5
Value of gross agricultural output:				
In current prices, bln. roubles	1381	532	701	148
%	100	38.5	50.8	10.7
Share in GAO, %				
Agricultural organisations	44.6	57.3	40.6	17.9
Family farms	6.1	4.5	5.7	13.6
Household plots	49.3	38.2	53.7	68.6
<b>2010</b>				
Number of Regions	78	23	33	22
%	100	29.5	42.3	28.2
Value of gross agricultural output:				
In current prices, bln. roubles	2618	946	1157	515
%	100	36.1	44.2	19.7
Share in GAO, %				
Agricultural organisations	44.5	60.5	41.9	21.1
Family farms	7.1	5.5	6.6	11.4
Household plots	48.4	34.1	51.6	67.5

Source: Calculations are made on Central base statistical data of Rosstat



In 2000, 23.4 % of regions had a corporative agrarian structure, while 22.1 % had a family agrarian structure. More than half of the Russian regions had a mixed agrarian structure. The number of regions with a family agrarian structure has since increased (from 17 to 22 in 2010), as well as with corporative one (from 18 to 23). In regions with a corporative structure 60 % of gross regional agricultural output is provided by agricultural organisations while in regions with a family structure family farms and household plots amount up to 80 % of agricultural production. There are several factors which influenced such sharp differentiation of the regional agrarian structures:

- Climatic and economic conditions;
- Availability of agricultural land;
- Ethnographic factor<sup>36</sup>;
- Regional agrarian policy.

The family agrarian structure is mostly common for the strongly depopulated eastern and northern regions of Nechernozemye<sup>37</sup> and in many National Republics (Northern

Caucasus, Kalmykia). In contrast, the corporative type is present in regions with the most favourable natural and economic conditions such as Belgorod, Krasnodar, Stavropol, Lipetsk (South of Russia), Moscow and Leningrad regions. The agrarian policy in Astrakhan, Saratov, Samara regions, Tatarstan and Baskortostan Republics is aimed on the support of small business which has successfully developed there. In Moscow and Leningrad regions small business does not receive State support, and respectively its share in gross output is very low.

### 2.3.3. Concentration of production: the role of agroholdings

The concentration of production in the largest agricultural organisations increases each year. This is illustrated by concentration and differentiation ratios (Table 29) and Lorenz curves for the distribution of market revenues from the sale of marketable products (Fig. 15). In 1995 the top 10% largest farms produced 42% of marketable products. The production share of this group was 70 times larger than the one of the first group (0.6%). In 2005 the production share of the largest farm enterprises (top 10%) increased to 62.8% and exceeded the production share of the first group by a factor of 996. In 2008 the differentiation coefficient between the first and last deciles was reduced to approximately 600.

**Table 29: Concentration and differentiation ratios of revenues from sales of marketable products**

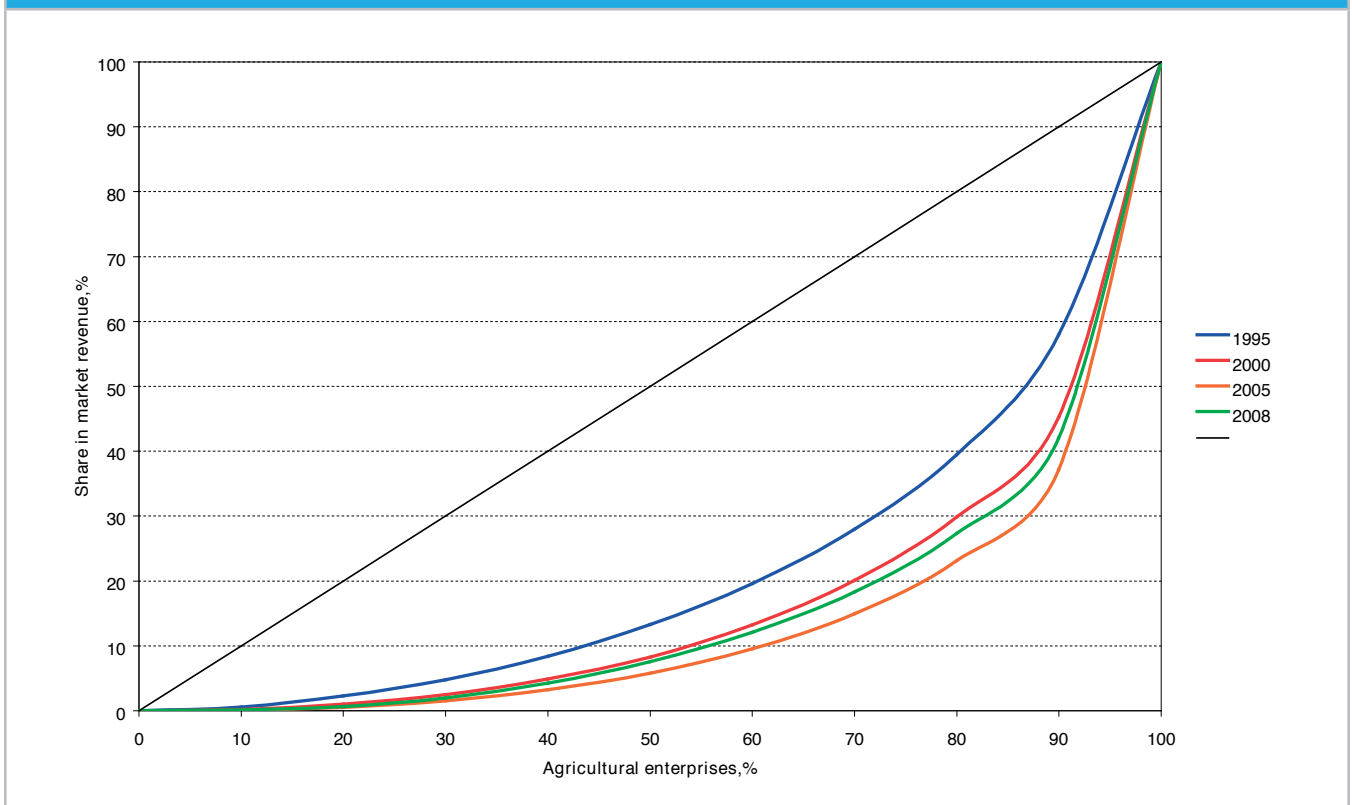
Year	Number of enterprises in a group, %										Concentration coefficients	Differentiation coefficients
	10	20	30	40	50	60	70	80	90	100		
Revenues of the groups of enterprises, %												
1995	0.6	2.3	4.8	8.4	13.3	19.6	28.0	39.5	58.0	100	0.55	70
2000	0.2	1.0	2.5	4.9	8.3	13.2	20.1	29.9	45.3	100	0.65	273.5
2005	0.1	0.5	1.5	3.2	5.8	9.5	15.0	23.1	37.2	100	0.71	996.5
2008	0.1	0.6	2.0	4.3	7.5	12.1	18.3	27.3	42.1	100	0.67	600.6

Source: Author's calculations

<sup>36</sup> Composition of the rural population of the region of the Russian Federation by nationalities

<sup>37</sup> Nechernozemye – a zone characterised by poor soils in comparison with Black-Soil zone. Nechernozemye is located in the Northwest and Central European part of Russia and consists of 32 regions of Russia.

**Figure 15: Lorenz curves for distribution of market revenues from sales of marketable products**



While the differentiation ratio has increased over time, the concentration ratio (Gini) has also followed a similar pattern. In 1995 the index was equal to 0.55 and has increased over time to reach 0.67 in 2008. This process of concentration is also generally happening in the family farm sector. The average land area of the farm in the early 90ies was about 40 hectares, and in 2010 amounts to about 100 hectares. In Russia in 2006 there were 285 thousand family farms and individual entrepreneurs and the share of the largest 5,000 of them accounted for almost half of the total standardised revenue<sup>38</sup>. While at the beginning of the agrarian reforms it was expected that family farms of a Western type would replace collective and state farms, large agricultural enterprises, agro-firms and agro-holdings that have incorporated in their structure several or even dozens of former state or collective farms, have dominated agricultural production.

The list and composition of agricultural holdings<sup>39</sup> of Russia is determined by a special methodology, which is given in OECD (1998). On the basis of the registration documents from the Rosstat database, owners of each agricultural organisation are identified. According to available data for Russia, in 2006 413 state and municipal and 318 private agroholdings have been identified. The role of agroholdings in Russia agriculture is clearly illustrated by Tables 30 and 31.

The most effective farms are agricultural holdings with foreign parent companies: their average profitability was 25.9 %, against 12.5% for independent large and medium agricultural enterprises in 2005. The least efficient farms have been state agricultural holdings (with an average profitability of 4%). Municipal agroholdings were not profitable (-12.5%). Private agro-holdings incorporated 2.6 % of the total number of employees engaged in agricultural commodity production. They used 3.6% of agricultural land. Their share in revenues from sales of agricultural products amounted to 7.3%.

38 For the method of calculating of this indicator, see 2.3.5.

39 Agricultural holding – is a group of the legal independent agricultural, processing and service organisations, control shares of authorised capital of which belongs to one entity (the parent organisation, the owner), which manages (organises management) of the activities of the group.

Table 30: Role of agroholdings in large agricultural businesses

Type of agroholdings	Number of agroholdings	Proportion of large and medium agricultural enterprises	Per cent of the total, %					Profitability, %
			Average annual number of employees	Agricultural land area	Sale revenues	Profit		
1. Private agroholdings	319	7.4	10.1	9.1	15.4	21.1	17.6	
Incl. Russian <sup>4</sup>	318	6.5	8.5	8.1	10.8	12.5	14.4	
foreign <sup>5</sup>	1	0.9	1.6	1.0	4.6	8.7	25.9	
2. State agroholdings	463	13.3	13.3	11.1	11.1	3.9	4.0	
Incl. Federal	9	4.6	6.3	5.0	4.8	1.8	4.3	
Regional	72	4.2	4.7	3.5	5.4	3.3	7.2	
Municipal	382	4.5	2.2	2.7	0.9	-1.2	-12.5	
3. Independent agricultural enterprises (not included in agroholdings)		79.3	76.7	79.8	73.5	74.9	12.5	
Large and medium-sized agricultural enterprises, total		100.0	100.0	100.0	100.0	100.0	12.2	

Source: Author's calculations

40 All private agroholdings, excluding foreign, that incorporate 2 and more agricultural enterprises in their structure.

41 All agricultural enterprises belonging to foreign residents and legal operators, were combined into one agricultural holding. To establish the true number of foreign parent companies on the basis of available information is not possible.

**Table 31: Role of agroholdings in Russian agriculture**

	Average annual number of employed in commodity production		Agricultural land area		Revenues from sales of agricultural products	
	persons	%	mln. ha	%	billion roubles	%
All agricultural producers <sup>42</sup>	7,100	100	191.5	100	799.7	100
Incl. large and medium agricultural enterprises	2,165	30.5	86.0	44.9	478.0	59.8
of which:						
Russian private agroholdings	183	2.6	6.9	3.6	58.1	7.3

Source: Rosstat database of agricultural enterprises, 2005

### 2.3.4. Agricultural cooperatives

The cooperative movement in rural Russia is relatively small. According to data from the Russian Ministry of Agriculture the number of registered agricultural service cooperatives is about 6,654 farms, including 1,195 engaging in processing activities, 3,688 in input and marketing activities (SPoK), 1,757 in credit activities (SKPK). A third of these cooperatives had no economic activity in 2010: 31.4% of credit, 36.9% of processing, 32.3% of input and marketing cooperatives did not work at all.

The distribution of these cooperatives is also region-specific as Vologda, Tyumen, Orenburg, Krasnodar, Zabaikalye, Krasnoyarsk regions, Buryatia, Tatarstan, Kalmykia, Mordovia, Chuvash Republics have more than 100 agricultural cooperatives each<sup>43</sup> and the Penza region (1144 working agricultural cooperatives, mostly SPoKs) and Sakha (Yakutia) Republic (214 SKPK) have the largest number of cooperatives.

In some regions credit cooperatives provide a volume of loans exceeding the amount from commercial banks. For example, in 2010 Tyumen cooperatives provided 489 mln. Roubles (i.e. about 12 mln. Euro) of loans to small producers while commercial banks provided an amount which was significantly less, i.e. 344 mln.roubles (about 8.6 mln. Euro). More than 100 mln. Roubles per year are provided by credit cooperatives in the Astrakhan, Volgograd, Kemerovo, Samara, Saratov and Krasnodar regions. As of now, agricultural credit cooperatives hold only 6% of financial rural markets, but they have become important players of the State Program on agriculture.

42 Agricultural enterprises, family farms, household plots, other plots of population from which agricultural products could be produced (gardeners, orchards, plots for recreation (dachas) etc.)

43 Regions and republics have equal status in administrative division of Russian Federation. Republics characterise with significant presence of nation other than Russian (for example tatars in the Tatarstan Republic).

So far, agricultural cooperatives are present in more than a thousand rural settlements across Russian regions. Its member base includes more than 200 thousand people, with financial assets of 10 bln. roubles. The agricultural cooperative system consists of three layers: the first layer is at the local (or rayon) level; the second works at the republic level and the third at the federal level. In Russia, only 34 regions have regional cooperatives. Their rapid development coincided with the existence of regional programs on agricultural cooperative development. This is confirmed by the monitoring activities of the State Program led by VIAPI in 2006 and 2009 that has shown that rural populations think that the main impediments for agricultural cooperative development in rural Russia are the under-capitalisation of processing cooperatives, of machinery and technology for inputs and the lack of funds for credit cooperatives.

### 2.3.5. Economic classification of agricultural producers

The identification of economic classes uses information from the Agricultural Census of 2006 and relies on the calculation of standardised revenues (Uzun et al, 2011). In particular, farm operators are economically classified depending on their standardised revenue. However, two types of operators have been set apart, before starting the classification, since the Census lacked relevant information. The first type includes abandoned operators that did not have agricultural production are part of Agricultural Census-2006 data<sup>44</sup>. This abandoned entity class consists of:

- Agricultural organisations that stopped undertaking their agricultural activity and have not had any off-farm activity and rent out their land plot(s).
- Family farms and individual entrepreneurs that stopped undertaking their agricultural activity and have not had any off-farm activity and rent out their land plot(s).

44 Their owners have answered "No" to the question "Do you have any agricultural activity in your holding/plot?", and many of them have not been even found by interviewers.

- Household plots with abandoned plots and depopulated houses.
- Gardeners and dacha dwellers that did not cultivate their land plots.

These categories of operators are called abandoned irrespectively on whether they owned input resources. The number of these abandoned operators is quite enormous, about 4.6 million, and they possess a significant amount of resources. Further, operators, which have not performed an agricultural activity in 2006, but have had off-farm activity, have been set apart in another group. This group includes:

- Agricultural organisations that ceased to perform or suspended their agricultural activity, but have had some off-farm activity.
- Family farms and individual entrepreneurs that ceased to perform or suspended their agricultural activity, but have had some off-farm activity.
- Household plots which have reported no agricultural activity, but without abandoned plots and depopulated houses.
- Gardeners and dacha dwellers that have not indicated a sowing area, area of perennials or number of livestock.

Those operators, whose standardised revenue was equal to zero, have been put into the last group, even if they have reported some agricultural activity.

### *Identification of classes*

Given the two classes of operators described above, all other operators have been grouped according to the size of their standardised revenue into 19 groups:

Classes and sub-classes are then identified, giving the following classification:

#### **1. Operators without agricultural production.**

This class has two sub-classes:

- abandoned or not functioning (group 1);
- Having some off-farm activity with no agricultural activity (group 2).

#### **2. Residential and recreational households (group 3)**

This class consists of households with standardised revenue up to 10,000 roubles ("kitchen gardens"). The average standardised revenue does not have much importance for the family budget in this group (i.e. it represents much less than the value of natural products harvested in private plots for self-consumption). In this case, agricultural production is typically a recreational activity that is performed mainly during weekends. Primarily, they produce crops for family needs and the production grown is considered to be most ecological. The growing of exotic crops is relatively common. The value of natural products consumed in this group per urban resident per month was equal to 166 roubles or 2% of available resources in 2006 (Uzun et al., 2006). Having 2.7 persons per family on average in Russia, the household with standardised revenue up to 10 thousand roubles might provide no more than 309 roubles of monthly surplus to the budget. According to the FAO recommendations, a group that is producing less than 5 % of gross agricultural output, and which does not have agricultural production as a main source of income, might be excluded from the aggregated data of the Agricultural Census. This is relevant to Group 3.

Group number	Group intervals (standardised revenue), thousand roubles	Sub-classes of operators	Classes of operators	
1	0	Abandoned (not functioning)	Operators without agricultural production	
2	0	Having off-farm production with suspended agricultural activity		
3	0>0<=10	Subsidiary commodity family farms	Residential and recreational	
4	>10<=30		Self-consumption	
5	>30<=50			
6	>50<=80			
7	>80<=110			
8	>110<=150			
9	>150<=220			
10	>220<=300			
11	>300<=500		Family farms	Commodity operators
12	>500<=750			
13	>750<=1500			
14	>1500<=3000			
15	>3000<7500	Capitalistic		
16	>7500<=15000			
17	>15000<=30000			
18	>30000<=150000	Large and super-large capitalistic		
19	>150000			

Source: Author's calculations

### 3. Self-consumption households (standardised revenue from 10 to 30 thousand roubles) (group 4).

The average standardised revenue in this group is about the value of natural products consumed within the household. These households usually produce for self-consumption purposes. They are involved both in crop and livestock production which is an important source of family resources. The value of natural products per rural resident in this group per month was equal to 561 roubles, of resources available – 4,495 roubles, or 12.3 % of all available resources in 2006. It remains a very important source of food for rural residents.

### 4. Commodity operators produce more than 30,000 roubles (groups 5-19).

They sell crop and livestock production in the volumes that exceed internal needs. While in the USA and other developed countries the farmer's production is mostly marketed, in Russia, small households still produce primarily for family consumption. Yet, commodity and service exchange is rather

common. Uzun et al. (2006) have used the methodology of the US Department of Agriculture to define the intervals of standardised revenue between groups and have defined 4 sub-classes within this specific class:

- 4.1. Subsidiary commodity family farms. Less than 50% of family incomes are extracted from the agricultural activity (standardised revenue 30-300 thousand roubles) (groups 5-10).
- 4.2. Family farms. The main family incomes are from the agricultural activity, or providing income to 3-5 employees, if any (standardised revenue 300-3,000 thousand roubles) (groups 11-14);
- 4.3. Capitalistic operators (farms). Hired labour is prevailing (standardised revenue from 3 to 30 mln. roubles) (groups 15-17);
- 4.4. Large and super-large capitalistic operators (farms). Both workers and managers are hired. Standardised revenue is more 30 mln. Roubles (groups 18-19).

### Characteristics of classes identified

The main characteristics of each class and sub-class of farm operators are now detailed.

#### *Operators without agricultural production*

The Agricultural Census data reports that 6 million of operators (16.2 % of aggregated data) have not produced any agricultural production in 2006. 19 thousand of agricultural organisations (32.5 %), 139 thousand of family farms (48.6 %), 2.6 millions of household plots (Household Plots) (11.4 %), 3.2 million (23.4 %) of garden plots and dachas are among those operators (Table 32). It is noteworthy to mention that operators of this class keep large areas of lands designated for agriculture: about 110 mln. ha. Most of these lands belong to agricultural organisations. Consequently 63.5 % of all fallow lands in Russia are concentrated by the

above-mentioned agricultural organisations. Agricultural organisations have a lot of arable lands (6.6 mln. ha), hayfields and pastures (7.8 mln. ha). Also 32 % of non-claimed<sup>45</sup> land shares are accumulated in this class. There are two sub-classes in this class: abandoned and having off-farm activity with no agricultural activity.

#### *Abandoned lands (group 1)*

This sub-class includes 4.6 mln. operators (8 thousand agricultural organisations, 72 thousand family farms, 1.6 million Household plots and 2.9 million gardens and dachas). Almost 47 million ha of lands designated for agricultural use and 12.4 million ha of agricultural lands belong to them. There are no other data on this type of land. The main share of lands (41.6 mln. ha) is at the disposal of agricultural organisations. A number of agricultural organisations of this sub-class still exist, but do not function.

<sup>45</sup> Non-claimed land shares mean that their owners did not make any arrangements on how to use them and did not transfer them to anybody

**Table 32: Characteristics of operators without agricultural production**

Ratios	Total		including:			
			Subclass of abandoned		Subclass of functioning without agricultural production	
	ratio	% of AD*	ratio	% of AD*	ratio	% of AD*
Number of operators, thousand	5,984	16.2	4,558	12.3	1426	3.9
Including						
Agricultural organisations	19	32.5	8	13.7	11	18.8
Family farms	139	48.6	72	25.1	67	23.5
Household plots	2,594	11.4	1,556	6.8	1,038	4.6
Garden plots and dachas	3,232	23.4	2,922	21.2	309	2.2
Total land area, thousand ha	87,853	19.5	46,942	10.4	40,911	9.1
Including						
Agricultural organisations	80,629	19.7	41,637	10.1	38,992	9.5
Family farms	5,767	19.6	4,523	15.4	1,244	4.2
Household plots	1,102	11.5	487	5.1	615	6.4
Garden plots and dachas	355	28.4	294	23.6	60	4.8
Agricultural land area, thousand ha	23,309	14.1	12,415	7.5	10,895	6.6
Including						
Agricultural organisations	19,434	14.7	10,130	7.7	9,304	7.0
Family farms	2,794	11.6	1821	7.5	973	4.0
Household plots	1,046	12.1	463	5.4	582	6.7
Garden plots and dachas	35	4.7	0	0.0	35	4.7
Out of total agricultural land – not reclaimed land shares, thousand ha	7,142	31.9	3754	16.8	3,388	15.1
Areas rent out, thousand ha	18,274	27.8	0	0.0	18,274	27.8
Use of land of FF ceased the agricultural production, total land, thousand ha	8,557	100.0	4594	53.7	3,963	46.3
Including						
Use in private plots	86	100.0	0	0.0	86	100.0
Rent out	3,615	100.0	0	0.0	3,615	100.0
Sold	79	100.0	71	90.2	8	9.8
Not used	4,778	100.0	4523	94.7	255	5.3
Power of tractors rent out, ths. kWt	960	60.1	95	5.9	865	54.2
Engaged in off-farm production, thousands household plots	18	37.1	1	1.4	17	35.6
Including						
Agricultural organisations	4	20.3	0	0.7	4	19.5
Family farms	14	50.5	1	2.0	13	48.5

Source: Author's calculations. Notes: \* Aggregated Data (AD)



They are former collective and state farms (*kolkhozy* and *sovkhozy*) that have been reorganised into production cooperatives and societies with limited liability. These farms have usually worked in a very inefficient manner and have gone bankrupt, but have not gone through official bankruptcy procedures. Employees have been fired, and at times, you might find a director and an accountant.

#### *Functioning without agricultural production (group 2)*

This sub-class includes 11 thousand agricultural organisations, 67 thousand family farms, about 1 million household plots and 309 thousand gardens and dachas, 1,396 thousand operators in total. Almost 50 million ha of lands designated for agricultural use and 10.9 million ha of agricultural lands belong to them. In contrast with the

1<sup>st</sup> group, operators of this sub-class perform some types of activity. They have rented out their lands very actively: totally 21.9 mln. ha of agricultural lands were rented out which made 33 % of all lands rented in 2006. 7,000 agricultural organisations of this sub-class leased land. They have rented out 17.2 mln. ha of agricultural lands (for example, agricultural organisations from other classes have rented out just 4.5 mln. ha). The average area rented out was equal to 2.5 thousand ha. Taking into account that each agricultural enterprise traditionally belongs to one (or two) owner(s), one could say that there is an emergence of a land lordship system that has arisen: those landlords have taken, bought and captured land from the State during the reforms, but have not used land, preferring renting it out. One can see a similar picture in the behaviour of family farms, which for some, behave as rentier (Table 33).

**Table 33: Grouping of operators by the size of agricultural lands rented out**

Groups	Number of entity		Area rented out, ths. ha		Area per 1 holding, ha	
	Family farms	Agricultural organisations	Family farms	Agricultural organisations	Family farms	Agricultural organisations
Less than 100 ha	33,040	1,023	697	39	21	38
>100 ≤500	2,334	990	429	275	184	277
>500 ≤1000	223	872	161	650	724	745
>1000 ≤3000	48	2,280	80	4,384	1,668	1,923
>3000 ≤10000	10	1,708	49	8,389	4,927	4,912
>10000 ha	6	229	2,467	3,581	411,144	15,638
Total	35,661	7,102	3,883	17,317	109	2,438

*Source: Author's calculations*

The major part of family farms (33 thousand) has on average rented out 21 ha of agricultural lands. Still, there exist 48 farmers who have rented out 1.7 thousand ha of agricultural land each, 10 farmers – 5 thousand ha each. The most surprising fact is to find several farmers who have rented out 0.4 million ha of land designated for agriculture. A similar pattern can be found between agricultural organisations: 4.2 thousand have rented out 2-15.6 thousand ha of agricultural land each. In agroholdings – super-large

farms – latifundists manage to cultivate their own or rented agricultural land using hired labour. In this specific case one might see landlords having rented out the totality of their lands. In this scheme practically all tractors are rented out as well (their share in all tractors rented out is 60%). This sub-class is rather important for off-farm production and service development. It contains 50.5% of family farms and 20.3% of agricultural enterprises which are involved in off-farm activity.

**Table 34: Main ratios of agricultural producers, by class**

	Agricultural producers, total	Residential and Recreational operators		Consumer operators		Commodity operators	
		Ratio's meaning	% total	Ratio's meaning	% to total	Ratio's meaning	% to total
1. Number of operators, thousand	30,943	23,532	76.0	3,454	11.2	3,957	12.8
including							
Agricultural organisations	40	1	2,3	1	3,6	38	94,1
Family farms	147	37	25,4	10	6,9	99	67,7
Household Plots	20,194	13.065	64,7	3.316	16,4	3.814	18,9
Gardens and dachas	10,562	10.429	98,7	127	1,2	7	0,1
2. Standardised revenue, mln. roubles	1,076,548	58,417	5.4	61,889	5.7	956,242	88.8
including							
Crop production	454,104	51.866	11,4	30.274	6,7	371.964	81,9
Animal breeding	622,444	6.551	1,1	31.615	5,1	584.278	93,9
3. Area, thousand ha							
converted to 1 ha of crop planted	120,492	17,224	14.3	7,197	6.0	96,071	79.7
total	362,636	3,525	1.0	2,224	0.6	356,887	98.4
agricultural	142,523	2,549	1.8	1,474	1.0	138,500	97.2
4. Number of livestock, thousand heads							
converted to 1 head of milk cow	2,6151	314	1.2	1,636	6.3	24,202	92.5
cattle	23,504	57	0.2	1,194	5.1	22,252	94.7
pigs	17,092	147	0.9	1,255	7.3	15,690	91.8
sheep's and goats	22,459	899	4.0	1,725	7.7	19,834	88.3
poultry	391,152	22,402	5.7	37,196	9.5	331,554	84.8
5. Labour resources, thousand persons							
including							
permanent	2,542	11	0,4	7	0,3	2.524	99,3
temporary and seasonal	39,108	25.362	64,2	6.314	16,1	7.432	19,0

	Agricultural producers, total	Residential and Recreational operators		Consumer operators		Commodity operators	
		Ratio's meaning	% total	Ratio's meaning	% to total	Ratio's meaning	% to total
6. Technical equipment							
tractors, kWt	70,850	3,034	4.3	2,424	3.4	65,393	92.3
including							
Agricultural organisations	43,042	31	0,1	67	0,2	42.944	99,8
Family farms	11,693	323	2,8	249	2,1	11.121	95,1
Household Plots	16,116	2.680	16,6	2.108	13,1	11.328	70,3
Trucks and cars	861	234	27.3	88	10.2	538	62.5
including							
Agricultural organisations	306	1	0,2	1	0,3	305	99,5
Family farms	56	1	2,7	1	2,6	52	94,7
Household Plots	499	232	46,6	86	17,2	181	36,2
7. Agricultural land area, ths. ha							
In ownership	18,517	1,048	5.7	672	3.6	16,797	90.7
In rent	77,076	161	0.2	171	0.2	76,744	99.6
Actually used	117,238	109	0.1	142	0.1	116,987	99.8

Source: Author's calculations

### Residential and recreational households (group 3)

This class contains households that are used mainly for residence or recreation. Agricultural production is not the main goal of such households and is rather small-scale. This class has more than 1 mln. household plots and 0.3 mln. gardens and dachas. They are gardeners and the dacha's dwellers cultivating lawns, decorative vegetation, and owners of household plots having a land plot, but receiving all incomes from off-farm activity. It represents about 76% of the number of agricultural producers, including 25.4% of family farms, 64.7% of household plots, 98.7% of gardeners and dacha's dwellers (Table 34). Fruits, vegetables and potato from kitchen gardens are directly consumed by family members. When analysing household plots, there is

an unexpected result. Almost two-thirds produce the same amount of agricultural products than summer residents. They practically did not engage in livestock rearing. The number of such household plots was 13 million in 2006. Agricultural production has not played an essential role in family incomes or in natural consumption. This explains that the share of this class in the total number of permanent employees is negligible. At the same time, the minimisation of agricultural activity in these households has occurred although a huge number of members involved in agricultural production and seasonal workers have been retained. Except for labour resources, these households have a lot of tractors, trucks, cars and other technical items. All this technical potential is not used for agricultural production.

<b>Table 35: Main ratios within different classes per farm</b>				
	<b>Agricultural producers, total</b>	<b>Residential and Recreational operators</b>	<b>Including: Consumer operators</b>	<b>Commodity operators</b>
1. Standardised revenue - total, ths. roubles	34.8	2.5	17.9	241.6
2. Area, ha				
converted to 1 ha of crop planted	3.9	0.7	2.1	24.3
total	11.7	0.15	0.6	90.2
agricultural	4.6	0.11	0.4	35
3. Number of livestock, ths. heads				
converted to 1 head of milk cow	0.8	0.01	0.5	6.1
cattle	0.8	0.002	0.3	5.6
pigs	0.6	0.006	0.4	4
sheep and goats	10.7	0.04	10.5	15
poultry	12.6	1.0	10.8	83.8
4. Labour resources, ths. persons				
Total employees	1.5	1.1	2.2	3.4
including				
permanent	0.1	0.0005	0.002	0,6
temporary and seasonal	1.3	1.1	1.8	1,9
5. Technical equipment:				
Tractors, kWt	2.3	0.1	0.7	16.5
including				
Agricultural organisations	1,077.5	34.3	46.2	1,142.1
Family farms	79.8	8.7	24.7	112,0
Household Plots	0.8	0.2	0.6	3,0
Trucks and cars	0.02	0.02	0.1	0.2
including				
Agricultural organisations	7.7	0.6	0.6	8,1
Family farms	0.4	0.03	0.1	0,5
Household Plots	0.02	0.02	0.03	0,05
6. Agricultural land area, thousand ha				
In ownership	0.6	0.04	0.2	4.2
In rent	2.5	0.01	0.05	19.4

Source: Author's calculations

On average, there were 2.5 thousand roubles of standardised revenue per household for this class. That made 77 roubles per family member per month, 0.11 ha of agricultural lands,

0.05 ha of arable lands, 0.01 of livestock converted to a head of milk cow (Table 35). Such volume of resources gives

no opportunity to engage in a commodity production. In many cases it is not sufficient for family self-consumption.

#### *Self-consumption households*

The standardised revenue per household for this class of households is 17.9 thousand rub (447.5 Euro) per year, and this is the main evidence of its self-consumption nature (Table 38). At an average number of a rural family of 2.8 persons, it represents 533 roubles per person per month. The average value of natural products from private plots consumed by the rural family was 560 roubles per month (Rosstat, 2010). Thus, households with a production lesser than consumption needs cannot be market-oriented. This is supported by the answers of respondents who have mentioned that the main goal of their household plots is self-sufficiency (85% of respondents). According to the Agricultural Census of 2006, 80% have responded that commodity production is not their purpose. Household plots represented 96% of households in this class.

#### *Commodity operators*

Operators, that have produced 30 thousand roubles of agricultural products per year, are included in this class. There are 12.8% of such operators in the Census (3.957 thousand operators). 94.1% (38 thousand) of agricultural organisations, 67.7% (99 thousand) of family farms, 18.9% of household plots (3.814 thousand) and 0.1% of gardeners and dachas (7 thousand) belong to this class (Table 36). Commodity operators keep 88.8% of total standardised

revenue, 97.2% of agricultural land, 92.5% of livestock and poultry converted to milk cows. They use 99.3% of all permanent agricultural employees, 92.3% of tractors (on power), and 99.6% of rented areas. Groups 5-19 accumulate operators with standardised revenue from 39 thousand roubles (5<sup>th</sup> group) to 335 mln. roubles (19<sup>th</sup> group).

#### *Subsidiary commodity family farms (groups 5-10)*

This sub-class belonged to a subsidiary one (Uzun et al., 2009) since the family does not get more than 50% of their income out of their plot. 98.3% of the sub-class consisted of household plots. Household plots have dominated this sub-class, with livestock and poultry production being their main specialisation. Their share in livestock rearing was 34.4% and they owned 37.1% of total livestock (Table 36). They practically did not use hired labour – the share of total permanent employees was just 1.4 % (3.2 million owners for 35 thousand of employees). Households of this sub-class used 20% of total tractor's power and 27% of total trucks and cars. One subsidiary family farm on average has produced 67.4 thousand roubles of standardised revenue in 2006, including 55.5 thousand roubles from livestock production. It had 3.2 ha of converted to a head of cattle area (1.8 ha of agricultural and 0.8 ha of arable land), 2.5 of livestock and poultry converted to milk cows, 26 sotka<sup>46</sup> of potato, 5 sotka of vegetables. The agricultural output from these households exceeded the volume the family could consume. It was confirmed also by the respondents answers who said that "the household was the subsidiary source of income" in 40 % of cases, and the main one – in 1.7 % of cases.

<sup>46</sup> Sotka is 0.01 ha, one hundredth of ha. Term "sotka" is widely used in Russian economic literature.

**Table 36: Main ratios of the different sub-classes of agricultural producers**

Ratios	Subsidiary commodity family farms		Family farms		Capitalistic		Large and Super-large capitalistic	
	Ratio's meaning	% to total	Ratio's meaning	% to total	Ratio's meaning	% to total	Ratio's meaning	% to total
1. Number of operators, ths. including	3,847.9	12.4	83.9	0.3	20.9	0.1	4.8	0.02
Agricultural organisations	5.6	14.1	11.6	28.9	15.7	39.4	4.7	11.7
Family farms	52.2	35.6	41.9	28.6	5.1	3.5	0.1	0.1
Household Plots	3,783.3	18.7	30.4	0.2	0.1	0.0	0.0	0
Gardens and dachas	6.8	0.1	0.1	0.0	0.0	0.0	0.0	0
2. Standardised revenue - total, ths. roubles including	25,917.3	24.1	67,627	6.3	214,432	19.9	415,010	38.6
Crop production	45,147	9.9	40,213	8.9	122,140	26.9	164,464	36.2
Animal breeding	214,026	34.4	27,414	4.4	92,292	14.8	250,546	40.3
3. Area, ha converted to 1 ha of crop planted total agricultural	12,260	10.2	11,769	9.8	36,263	30.1	35,779	29.7
	11,319	3.1	61,479	17.0	152,721	42.1	13,1368	36.2
	7,051	4.9	21,171	14.9	66,112	46.4	44,166	31.0
4. Number of livestock, ths. heads converted to a 1 head of milk cow cattle pigs	9,709	37.1	1,318	5.0	3,990	15.3	9,185	35.1
	9,635	41.0	1,258	5.4	5,390	22.9	5,969	25.4
	6,798	39.8	832	4.9	1,306	7.6	6,754	39.5
sheep and goats	9,110	40.6	6,010	26.8	2,824	12.6	1,890	8.4
poultry	82,841	21.2	2,906	0.7	7,461	1.9	238,346	60.9
5. Labour resources, ths. pers. including permanent	35	1.4	183	7.2	1,025	40.3	1,281	50.4

Ratios	Subsidiary commodity family farms		Family farms		Capitalistic		Large and Super-large capitalistic	
	Ratio's meaning	% to total	Ratio's meaning	% to total	Ratio's meaning	% to total	Ratio's meaning	% to total
temporary and seasonal	7,161	18.3	110	0.3	85	0.2	76	0.2
6. Technical equipment:								
tractors, kWt including	13,892	19.6	10,030	14.2	23,001	32.5	18,470	26.1
Agricultural organisations	603	1.4	4,047	9.4	20,043	46.6	18,251	42.4
Family farms	2,435	20.8	5,511	47.1	2,957	25.3	218	1.9
Household Plots	10,854	67.4	473	2.9	1	0.0	0	0.0
7. Trucks and cars including								
Agricultural organisations	6	1.9	27	8.8	134	43.9	138	44.9
Family farms	13	23.8	25	45.6	13	23.3	1	2.0
Household Plots	175	35.1	6	1.2	0	0.0	0	0.0
8. Agricultural land area, ths. ha								
In ownership	2,449	13.2	3,874	20.9	5,975	32.3	4,499	24.3
In rent	1,919	2.5	11,394	14.8	35,799	46.4	27,632	35.9
Actually used	2,442	2.1	16,511	14.1	56,441	48.1	41,592	35.5

Source: Author's calculations

*Family farms sub-class (groups 11-14)*

The main family incomes are from the agricultural activity, or providing income to 3-5 employees, if any. This sub-class consists of 83.9 thousand households, including 11.6 thousand agricultural enterprises, 41.9 thousand Family farms and 30.4 thousand household plots. Most of

standardised revenue (55 %) has come from family farms, 22.5 % - from agricultural enterprises and 22.5 % - from Household plots. The revenue from crop production has prevailed in standardised revenue. Average standardised revenue per household was about 805.9 thousand roubles (Table 37).

<b>Ratios</b>	<b>Subsidiary commodity family farms</b>	<b>Family farms</b>	<b>Capitalistic</b>	<b>Large and Super-large capitalistic</b>
1. Standardised revenue - total, thousand roubles	67.4	805.9	10,268.2	87,022.4
2. Area, ha				
converted to 1 ha of crop planted	3.2	140.2	1,736.5	7,502.5
total	2.9	732.6	7,313.2	27,546.3
agricultural	1.8	252.3	3,165.8	9,261.0
3. Number of livestock, thousand heads				
converted to 1 head of milk cow	2.5	15.7	191.0	1,925.9
cattle	1.1	5.1	98.4	429.8
pigs	1.8	9.9	62.5	1,416.3
sheep and goats	2.4	71.6	135.3	396.2
poultry	21.5	34.6	357.3	49,978.2
4. Labour resources, thousand persons				
permanent	0.01	2.2	49.1	268.5
temporary and seasonal	1.9	1.3	4.1	16.1
5. Technical equipment:				
tractors, kWt	3.6	119.5	1,101.4	3,872.89
including				
Agricultural organisations	107.5	349.9	1,273.6	3,894.86
Family farms	46.6	131.5	583.9	2,632.22
Household Plots	2.9	15.6	16.1	-
Trucks and cars	0.10	0.8	7.1	29.1
including				
Agricultural organisations	1.0	2.3	8.5	29.3
Family farms	0.3	0.6	2.6	13.7
Household Plots	0.05	0.2	0.3	-
6. Agricultural land area, thousand ha				
In ownership	0.636	46.2	286.1	943.4
In rent	0.5	135.8	1714.3	5794.0

Source: Author's calculations



This sub-class made 6.3% of standardised revenue (8.9% of crop production, 4.4% of livestock production), 14.9% of agricultural lands, 14.3% of crop planted, 8.6% of perennials, 26.8% of sheep and goats. On average, they had a large plot of land (252 ha of agricultural land per 1 household), technical equipment (119.5 kWt of tractor power per 1 household). Household plots out of this sub-class have about 14 ha of agricultural land and 20 of heads of livestock and poultry converted to milk cows per household. 80% of respondents said that their household was an important source of their income, i.e. 85 %. They have sold at least one agricultural product in the market. The share of products marketed was quite high: sunflower, beetroots, linen and wool – more than 90 %, vegetables and grapes – more than 70 %, dairy, fruits and berries, honey – more than 60 %, potato, livestock and poultry – more than 50 %. These households consisted of 5.2 persons, including 2.2 permanent workers and 1.3 temporary and seasonal workers on average.

#### *Capitalistic operators (groups 15-17)*

There were 20.9 thousand of such farms, predominantly agricultural organisations (15.7 thousand). This sub-class also included 5.1 thousand of family farms. Capitalistic farms produced 20% of standardised revenue out of the total in 2006 (26.9% of crop production and 14.8% of livestock and poultry production). These operators held 46.4% of total agricultural land, 45.8% of crop area, 22.9% of livestock inventory, and 32.5% of tractor's park power. Really large farms have formed this sub-class. There are 3,166 ha of agricultural lands, 191 converted to a head of cattle heads of livestock and 54 hired workers per capitalistic farm. 49.1 permanent employees work under the management of a single owner on average.

#### *Large and super-large capitalistic farms (groups 18-19)*

There were 4769 farms, predominantly agricultural enterprises (4686) and only 83 family farms. Their number was limited but they accounted for 38.6 % of standardised revenue, equally coming from crop and livestock productions. There were 87 mln. roubles of standardised revenue, 9.3 thousand ha of agricultural land, 3.3 thousand ha of crop area, 1926 of cattle converted to milk cow heads, almost 50 thousand poultry heads per large farm. Tractor's park power per large farm is 3,873 kWt. Labour force was mainly hired.

## 2.4 Concluding remarks

- i. The analysis of the ownership and access to agricultural inputs, particularly land and assets, is important for an overall assessment of the food security situation in Russia. Agrarian reforms implemented during the transition to a market economy in post-Soviet Russia have deeply affected the reallocation of land and assets in rural areas.
- ii. The specific implementation of reforms in post-Soviet Russia prevented the splitting of land into thousands of small plots. However, the emergence of a market for land shares has also generated high transaction costs and corruption. Agrarian reforms in each region of Russia had its own specific features. The privatisation of land was not carried out in all regions. For example, in some regions, preference was given to the preservation of state farms (i.e. Chechen Republic) or the creation of producers' cooperatives.
- iii. As a result of the reforms 11.8 million people became owners of property and land shares (approximately 120 million hectares). The majority of shareholders have leased their land. Only a small part of the shareholders got property in-kind for their shares in order to create family farms. Overall, post-Soviet reforms have shaped the structure of the farming sector in Russia and the capacity of the agricultural sector to use land and assets and therefore to produce.
- iv. One fundamental element of the environment in which farmers operate is defined by the set of regulations, which directly affect farming activities and define the operating framework for agricultural and rural development policies.
- v. Government support for agriculture is mainly aimed at stimulating production (e.g. subsidies to support expenditures or loans), most of which has been traditionally classified in the Amber Box. Upon WTO accession the mechanisms are due to change and a strong increase in Green Box subsidies is likely to occur.
- vi. While the budget of agricultural policies is relatively small in comparison with the world's largest developed economies, the provision and distribution of federal subsidies across regions requires co-financing from the republics.
- vii. While most of the farm support subsidies are directed towards agricultural enterprises, whose output is marketed (and possibly exported), the existence of farm support strongly contributes to the sustainability of many farms through positive impacts on profitability and gross agricultural output.
- viii. Meanwhile, rural development policies are very limited and cannot prevent rural depopulation and the increasing income gap between urban and rural areas.
- ix. Farmers perceive State Program measures as positive, though they think they have no significant impact on agricultural development. Also, farmers seem to consider the business environment as favourable.
- x. The most radical changes within the farming structure over the last 20 years are the resurgence of household plots and the concentration of agricultural outputs in

- large agricultural organisations. Among the largest enterprises, foreign companies are typically the most efficient and profitable.
- xi. There have also been changes in farming practices as household plots have specialised in labour-intensive crops while agricultural enterprises have specialised in cereals and industrial crops that require mechanisation and large areas.
  - xii. The agrarian structure across Russia has also dramatically been affected as regions have different agrarian structures: the corporate sector has prevailed in 30% of the republics, with the predominance of large agricultural enterprises, agrofirms, and agricultural holdings. Approximately the same proportion of regions is characterized by the predominance of family farms and about 40% of regions have a mixed agrarian structure.
  - xiii. The economic classification of agricultural producers of Russia has allowed to identify 4 classes of producers: not producing agricultural products (6 million producers); producers that used their land for residential and recreational purposes (23.5 million producers characterised by agricultural output less than 10 thousand roubles per year per producer); agricultural producers that produced for self-consumption (3.5 million producers, agricultural output greater than 10 and less than 30,000 roubles per year per producer) and commercial producers (4 million producers, the value of agricultural output exceeded 30,000 roubles per year per producer). Commercial producers are divided into sub-classes: subsidiary (agricultural output 30-300 thousand roubles per year per producer), farmers (300-3000 thousand roubles per year), capitalist (3-30 mln. roubles per year), and large capitalist (more than 30 million roubles. per year).

# 3 Technical and economic effectiveness of the agricultural sector

Chapter 2 has shown that the reforms in Russia have led to many changes in the structure of the agricultural sector and farming, resulting today in a mixed agricultural economy. To complement this descriptive analysis, this chapter aims to study the economic effectiveness of various categories of agricultural organisations (i.e. Agricultural Enterprises, Family Farms, and Household Plots). Chapter 3 also examines the evolution of technical efficiency of agricultural enterprises during the transition to a market economy. The analysis is based on the Data Envelopment Analysis (DEA) method and allows deepening further the understanding of changes that have occurred in the agricultural sector, especially in terms of productivity. The chapter finally provides impact analyses of both government budget policies on the financial stability of agricultural producers and of environmental protection measures aimed at environmental sustainability and the mitigation of adverse impacts on the environment.

## 3.1. Comparative effectiveness of agricultural operators

The following indicators are used to assess the comparative effectiveness of different categories of agricultural operators: gross production per hectare of agricultural land; gross production per annual average employee involved in commodity agricultural production. Table 40 presents land use ratios for agricultural enterprises, family farms and household plots.

<b>Table 38: Gross production per hectare of agricultural land</b>					
	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
<b>1. Gross production, in current prices, billion roubles*</b>	0.16	203.9	742.4	1, 380.9	2, 618.5
Agricultural Enterprises	0.116	102.3	335.6	615.6	1, 165.2
Family Farms**		4	23,6	84.3	186.9
Household Plots	0.042	97.6	383.2	681	1, 266.4
<b>2. Agricultural lands in use, million hectares</b>	213.8	209.6	196.8	191.7	190.8
Agricultural Enterprises	209.8	171.2	157.6	137.9	122.1
Family Farms**	0.1	10.5	14.5	19.5	23.8
Household Plots	3.9	9.9	24.7	34.3	44.9
<b>3. Gross production per hectare of agricultural land, roubles***</b>	0.7	973	3, 772	7, 203	13, 725
Agricultural Enterprises	0.6	598	2, 129	4, 464	9, 542
Family Farms**	0.0	381	1. 629	4, 323	7, 862
Household Plots	10.8	9, 859	15, 525	19, 854	28, 208

Source: Rosstat, 2011. Notes: \* 1990 and 1995 in trillion roubles. \*\* including individual entrepreneurs. \*\*\* 1990 and 1995 in thousand roubles

Household plots have the highest rate of land use effectiveness. In 1990 every hectare of agricultural land in household plots produced tenfold more than agricultural organisations (respectively 10.8 against 0.6). That is explained by the specialisation of household plots on the most intensive crops, such as potatoes, vegetables, fruit and berries, with a higher value per hectare; on the contrary, extensive crops are extensively cultivated by agricultural enterprises and family farms (i.e. grain, feed crops). Additionally, livestock products in household plots have been mainly produced using feed received from agricultural enterprises.

Higher labour productivity has led to lower employment, with the transition to a market economy resulting in a few adjustments, in particular, in a more effective use of labour resources. During the first reform phase (until 1995) the number of annual average employees in agriculture increased, but then started to drop sharply and reached 10.3 million people in 1994 and 6.6 million in 2011. Labour productivity in agriculture decreased until 1998, then it started growing and in 2011 reached slightly more than 131% compared to 1990 (Table 39).

**Table 39: Gross production (GP), employment and labour productivity: All agricultural operators**

Year	GP in actual prices, billion roubles*	Index of physical volume	GP in 2011 comparable prices, billion roubles	GP in % by 1990	Number of people employed in agriculture, billion people**	GP per employee, in thousand roubles	GP per employee in % by 1990
1990	0.158	96.4	3,674.0	100.0	9.7	378	100.0
1991	0.26	95.5	3,508.7	95.5	9.7	360	95.4
1992	2.7	90.6	3,178.9	86.5	10.1	315	83.3
1993	22.4	95.6	3,039.0	82.7	10.1	301	79.6
1994	73.7	88	2,674.3	72.8	10.3	260	68.9
1995	203.9	92	2,460.4	67.0	9.7	253	66.9
1996	283.4	94.9	2,334.9	63.6	9.3	252	66.7
1997	303.2	100.9	2,355.9	64.1	8.6	274	72.6
1998	298.4	85.9	2,023.7	55.1	8.7	232	61.4
1999	586	103.8	2,100.6	57.2	8.5	247	65.5
2000	742.4	106.2	2,230.9	60.7	9.0	248	65.7
2001	918.2	106.9	2,384.8	64.9	8.5	280	74.2
2002	968.2	100.9	2,406.3	65.5	8.2	292	77.4
2003	1,076.4	99.9	2,403.8	65.4	7.8	308	81.6
2004	1,253.2	102.4	2,461.5	67.0	7.4	331	87.7
2005	1,380.9	101.6	2,500.9	68.1	7.4	339	89.7
2006	1,570.6	103	2,575.9	70.1	7.1	361	95.5
2007	1,931.6	103.3	2,661.0	72.4	6.9	384	101.7
2008	2,461.4	110.8	2,948.3	80.2	6.7	442	116.9
2009	2,515.9	101.4	2,989.6	81.4	6.7	444	117.6
2010	2,587.8	88.7	2,651.8	72.2	6.7	398	105.5
2011	3,261.7	123	3,261.7	88.8	6.6	497	131.6

Source: Rosstat, 2011. Notes: \* 1990 to 1995 in trillion roubles. \*\*only employment in major and mediums agricultural enterprise is shown (till 2008 the source is Russian book of statistics for respective years, 2008-2011 the sources are consolidated annual reports of agricultural enterprises), the data on family farms and household plots indicates the number of those employed in commodity production (including minor agricultural organisations).

**Table 40: Gross production, employment and labour productivity: Agricultural enterprises**

Year	GP in actual prices, billion roubles*	Index of physical volume	GP in 2011 comparable prices, billion roubles	GP in % by 1990	Number of people employed in agriculture, billion people**	GP per employee, in thousand roubles	GP per employee in % by 1990
1990	0.116	94.2	2, 253.1	100.0	8.3	271	100.0
1991	0.179	91	2, 050.3	91.0	7.9	260	95.6
1992	1.8	82.7	1, 695.6	75.3	8.1	209	77.1
1993	12.8	90.9	1, 541.3	68.4	8.1	190	70.1
1994	40.2	83.9	1, 293.1	57.4	7.3	177	65.3
1995	102.3	84.6	1, 094.0	48.6	6.7	163	60.2
1996	140	89.9	983.5	43.7	6.2	159	58.4
1997	143.5	102.5	1, 008.1	44.7	5.7	177	65.2
1998	120.6	78.5	791.4	35.1	5.3	149	55.0
1999	249.8	105.4	834.1	37.0	5.1	164	60.2
2000	335.6	106.4	887.5	39.4	4.7	189	69.6
2001	421.8	111.1	986.0	43.8	4.2	235	86.5
2002	409.3	101.8	1, 003.7	44.5	3.8	264	97.3
2003	458.3	96.1	964.6	42.8	3.3	292	107.7
2004	573.5	104.9	1, 011.8	44.9	2.9	349	128.5
2005	615.6	103.1	1, 043.2	46.3	2.5	417	153.7
2006	704.5	104.3	1, 088.1	48.3	2.2	495	182.2
2007	918.5	104.9	1, 141.4	50.7	1.9	601	221.3
2008	1, 183.7	116.2	1, 326.3	58.9	1.7	788	290.3
2009	1, 141.5	100.8	1, 336.9	59.3	1.6	846	311.8
2010	1, 150	89.4	1, 195.2	53.0	1.5	807	297.2
2011	1, 540.6	128.9	1, 540.6	68.4	1.4	1097	404.1

Source: Rosstat, 2011. Notes: \* 1990 to 1995 in trillion roubles. \*\*only employment in major and mediums agricultural enterprise is shown (till 2008 the source is Russian book of statistics for respective years, 2008-2011 the sources are consolidated annual reports of agricultural enterprises), the data on family farms and household plots indicates the number of those employed in commodity production (including minor agricultural organisations).

By 1998 the gross production value of agricultural operators dropped threefold and equalled 35.1% of its value in 1990. In the following years it increased almost twofold; yet, in 2011 it only reached about 68% of its initial level of 1990. Employment in agricultural enterprises decreased by a factor of 6. Trying to be more competitive, agricultural enterprises

restructured and shed excessive human resources. Meanwhile, until 1998, output decreased faster than employment. As a result, labour productivity dropped. Since 1998 the increase of production output occurred simultaneously with the decrease of employment. This allowed increasing labour productivity in 2011 almost fourfold compared to 1990.

**Table 41: Economic indicators for Family Farms and Household Plots**

Year	GP in actual prices, billion roubles*	Index of physical volume	GP in 2011 comparable prices, billion roubles	GP in % by 1990	Number of people employed in agriculture, billion people**	GP per employee, in thousand roubles	GP per employee in % by 1990
1990	0.042	104	1,420.9	100.0	1.4	996	100.0
1991	0.081	102.6	1,458.4	102.6	1.8	794	79.8
1992	0.93	101.7	1,483.3	104.4	2.0	741	74.4
1993	9.6	101.0	1,497.7	105.4	2.0	748	75.1
1994	33.5	92.2	1,381.2	97.2	3.0	464	46.6
1995	101.6	98.9	1,366.4	96.2	3.0	449	45.1
1996	143.4	98.9	1,351.4	95.1	3.1	441	44.3
1997	159.7	99.7	1,347.8	94.9	2.9	466	46.8
1998	177.8	91.4	1,232.4	86.7	3.4	360	36.1
1999	336.2	102.8	1,266.5	89.1	3.4	373	37.5
2000	406.8	106.1	1,343.4	94.5	4.3	313	31.4
2001	496.4	104.1	1,398.8	98.4	4.3	325	32.6
2002	558.9	100.3	1,402.5	98.7	4.4	317	31.8
2003	618.1	102.6	1,439.3	101.3	4.5	320	32.1
2004	679.7	100.7	1,449.7	102.0	4.5	320	32.1
2005	765.3	100.6	1,457.7	102.6	4.9	299	30.0
2006	866.1	102.1	1,487.9	104.7	4.9	301	30.2
2007	1,013.1	102.1	1,519.6	106.9	5.0	302	30.4
2008	1,277.7	106.7	1,622.0	114.2	5.0	325	32.6
2009	1,374.4	101.9	1,652.7	116.3	5.2	321	32.2
2010	1,437.8	88.1	1,456.6	102.5	5.2	281	28.3
2011	1,721.1	118.2	1,721.1	121.1	5.2	334	33.5

Source: Rosstat, 2011. Notes: \* 1990 to 1995 in trillion roubles. \*\*only employment in major and mediums agricultural enterprise is shown (till 2008 the source is Russian book of statistics for respective years, 2008-2011 the sources are consolidated annual reports of agricultural enterprises), the data on family farms and household plots indicates the number of those employed in commodity production (including minor agricultural organisations).

Over the period of reforms, gross production increased by 21.1% in the sector of household plots. At the same time, employment grew (from 1.4 to 5.2 million people; that is, 3.7 times its initial value). Gross production per person employed in this sector decreased almost threefold. Due to fast employment volume growth and relatively slow gross production increase in small agricultural business, its productivity over the last years stabilized at 30-32% compared to 1990. Meanwhile, according to Rosstat statistics, gross production per annual average employee of household plots in 1990 was 3.7 times higher than that of

agricultural enterprises, and 3.3 times lower than in 2011. Over the recent years, direct labour costs per production unit confirm the stability of labour productivity growth trends in Agricultural enterprises (Table 42). Direct labour costs for all the basic agricultural products, except for beef, were significantly lower in 2011 than in 1990. In sugar-beet growing and pig rearing, direct labour costs in 2011 were 8 to 10 times lower than in 1990, and 3.3 to 4.5 times lower in potatoes, vegetables and poultry. Labour productivity in milk, grain, sunflower seeds, eggs production increased 1.6 to 2 times within the same period.

**Table 42: Direct labour costs per tonne of product in agricultural enterprises (man-hours)**

Year	Grain	Sunflower seeds	Sugar-beet	Potatoes	Field vegetables	Milk	Cattle weight gain	Pig weight gain	Poultry weight gain	Eggs
1990	9.5	11.5	7.3	26.8	38.4	63.8	340.9	257	51.6	1.96
1991	12.1	14.6	8.8	26.0	44.7	68.9	379	309	54.5	2.01
1992	11	17.1	8.7	29.4	58.3	80.9	450.2	212.4	65.4	2.28
1993	11.6	20.4	8.6	30.8	59.8	81.1	463.8	219.4	64.3	2.47
1994	12.5	21.8	11.3	35.6	57.2	87.7	521	261.4	66.1	2.51
1995	15.2	18.1	8.5	30.5	56.7	91.5	554.3	282.6	77.6	2.69
1996	13.5	23.1	9	29.9	56.7	99.8	612.4	328.1	76.4	2.55
1997	11.2	20.5	9.2	30.4	48.7	95.5	628.2	319.3	71.8	2.33
1998	17.5	22.4	10.2	29.6	55.4	93.1	616.2	294.5	69	2.26
1999	15.1	21.3	8.6	31.3	44.4	93	609.2	321.6	64.3	2.21
2000	13.3	21	8.7	29	43	89.9	578.5	286.3	60.2	1.99
2002	20.1	18.2	6.1	24.7	32.6	71.1	471.2	170.4	49	1.81
2003	11.4	16.5	4.7	19.2	24	64.3	453.3	162	41.9	1.67
2004	10.0	16.6	3.4	16.3	22.7	62.2	452.8	141.1	37.8	1.6
2005	9.1	13.1	2.7	13.0	19.0	54.1	397.2	114.4	31.2	1.4
2006	8.3	11.8	1.8	10.7	16.2	46.8	357.8	91.2	24.3	1.3
2007	7.5	11.8	1.4	9.3	14.4	41.5	335.4	70.5	21.0	1.3
2008	5.5	9.1	1.1	7.4	12.9	43.4	345.5	59.4	20.0	1.3
2009	5.5	10.1	1.0	6.3	11.6	44.0	310.2	41.9		
2010	7.4	11.8	1.3	10.8	12.2	36.2	363.9			
2011	4.9	7.0	0.7	6.0	8.8	31.3	384.8	31.3	15.8	1.2

Source: Consolidated annual reports of Agricultural enterprises

Labour productivity increases associated with the privatisation of agriculture allowed putting an end to practices which existed in the USSR of making students, schoolchildren, workers and civil servants travel to rural areas for compulsory seasonal farm work. The analysis of the above data has described the effectiveness of selected categories of agricultural operators. Still, some significant effectiveness differentiation can be seen within each category: some agricultural operators have higher production outputs, others – significantly lower. In an increasing competitive environment, ineffective businesses are compelled to stop their operations, as the average effectiveness of remaining enterprises will gradually grow. A deeper analysis of comparative technical efficiency of agricultural enterprises, varying by type of products is now presented.

## 3.2. Technical efficiency

The DEA methodology for calculating and comparing the effectiveness of agricultural enterprises has been applied in many studies (e.g. Bokusheva et al., 2011; Brock et al., 2008; Charnes et al., 1994; Hockmann et al., 2011). The key part of the methodology is the identification of *best practice* agricultural enterprises, which use their resources fully and effectively. In other words, none of the production factors in these *best practice* firms may be reduced without reducing the level of production of one or more products or without increasing other factors. The level of Technical Efficiency (TE) of these enterprises is assumed to be unity, while all other enterprises have TE scores of less than unity, i.e. they could, if the resources were available to them, produce more

products or reduce consumption of inputs for the current level of output. The key concept in DEA is technical efficiency, which is generally defined as the ratio of total weighted outputs to total weighted inputs.

$$\text{Technical Efficiency} = \frac{\sum \text{weighted outputs}}{\sum \text{weighted inputs}}$$

Among all farming units, DEA identifies efficient units by forming the “best practice frontier” and measures the inefficiency of the remaining farms with respect to their deviation from this frontier. The basic assumption is that efficiency or inefficiency of an enterprise is determined by its own decisions. The DEA efficiency<sup>47</sup> criterion is the achievement of a Pareto optimum; that is, in production theory, an economic situation is efficient at a given time, with a given technology process and inputs, if it is impossible to produce more of at least one product simultaneously producing the same quantity of other products<sup>48</sup>. 100% relative efficiency of an enterprise may be achieved only when in comparison to other respective enterprises there is no source for inefficiency in relation to one or several inputs or outputs. If the farms having similar inputs and outputs have the same objectives, they are marked as comparable. Hence the DEA method is based on this concept of relative efficiency.

The method for TE evaluation is based on the comparison of the actual output with the maximum possible output (resulting from the same inputs). Enterprises, which have maximum output for a unit of input, are viewed as “best practice models” and the use of inputs by the rest of enterprises is compared against the “best practice models”. The data of best practice enterprises is used for a production function, and the enterprises themselves form “the best practice frontier”. Efficiency is measured by the variance between the reviewed enterprises and “the best practice frontier”. The DEA method has a number of advantages compared to the stochastic frontier analysis (SFA):

- The model makes it possible to conduct a comparative assessment of production systems, accounting for multiple resources and products;
- DEA compares production enterprises and their ability to use the resources;
- The possibility of analogous comparison over a number of years.

The effectiveness of each farm is assessed by linear programming optimisation<sup>49</sup>. We use an input-oriented model (i.e. the output level remains unchanged and input quantities are reduced proportionately until the frontier is reached) with constant scale effects. Production factors included in the model are as follows: crop land area, average annual number of employees, value of production facilities assets (e.g. buildings, machinery, power equipment, and perennial plantings), working capital (costs) separately for livestock rearing and plant growing, number of relative livestock units.

The database of agricultural enterprises includes numerous individual production and economic ratios, characterizing farm performance over a year. The database is available for three years, i.e. 1995; 2002; 2008. Data come from annual reports of agricultural enterprises, which consist of statutory accounting statements. The database includes 254 variables related to:

- Identification (name, individual national code of enterprises and organisations, type of ownership code, etc.).
- Basic annual economic ratios and indicators (charter capital, profit/loss, sales revenue, etc.), average annual number of employees (including those involved in agricultural production).
- Production and economic ratios: sales (value and volume) cost of sales for each type of product (grain, sunflower, potato, vegetables, meats, milk and egg); total costs, included in the cost of plant-growing product, by type (labour, materials – seeds, fertilisers, pesticides, fuel, power, depreciation, etc.); total costs, included in the cost of livestock-rearing products, by type (labour, materials–feed, fuel, power, spare parts, depreciation, etc.).
- Production statistics: Cropland areas and gross yields; Livestock units (average annual, opening and closing) livestock by type and gross yields.
- Government support (total subsidies and subsidy by product and input).

As the main output variable, we use the cost of sold products of plant-growing, livestock rearing and non-agricultural operations. As the amount of inputs consumed and the level of output differ considerably across farms, we first group all enterprises by specialisation and we end up with three groups by specialisation (i.e. plant-growing, livestock breeding and miscellaneous). Plant-growing enterprises are further divided into three groups: most sales (over 50%) originating from the sales of grain and technical crops, potatoes and vegetables, or other types of plant-growing products.

47 An agricultural enterprise is 100 % efficient if: none of the outputs can be increased without either increasing one or more inputs, or reducing other outputs; none of the inputs can be reduced without reducing one or more outputs, or increasing other inputs.

48 Note that this definition is applicable only to the notion of relative efficiency and does not have to be applied so rigidly, as the real efficiency in most cases is unknown.

49 There is a number of software providing automatic calculations using the DEA method. The EMS software that we used is available at: (<http://www.wiso/ini-dortmund/de/LSFG/schttl/ems/>). This software limits the number of farms included in the analysis to 1000. Therefore for groups where the number of enterprises exceeded this limit, we randomly select the farms selected for estimation.



Livestock-breeding enterprises are further divided into four groups: cattle-breeding, pig-farming, poultry-farming and miscellaneous. Calculations of relative effectiveness scores are separately made for the group of agricultural enterprises, for 1995 (the year agricultural reform activities were launched), then for 2002 and 2008, so as to examine how the effectiveness of agricultural enterprises has evolved over time and understand better how the reforms have affected farms in the Russian Federation.

Before we present the results in details, we briefly look at the evolution of productivity for the different sectors. Average sectorial TE values are calculated by areas of specialisation. It is obvious that over time the TE of each sector has grown. This may mean that agricultural operators have responded to market signals. While the sectors for potatoes and vegetables, cattle and to a lesser extent for grains have considerably grown between 1995 and 2008 (respectively +54.6%, +33.4% and +10.4%), the performances of pig and poultry sectors have not substantially changed. Furthermore, as a result of these evolutions, the potato and vegetables sector appears to be very efficient on average while the grain sector is the least DEA-efficient on the five sectors in 2008.

### 3.2.1. Agricultural operators specialised in plant-growing

#### Grain and Technical Crops

In 1995 only 3.7% of farmers had technical efficiency scores of 1, and their average profitability was 72%. The share of operators having very low efficiency (i.e. of less than 25%) was 16.6% of the total group, and the profitability ratio of such operators was negative (-40.3%). The largest share of operators (54.8%) had low technical efficiency scores, varying from 25 to 50%, while their total profitability, with account of subsidies, was zero. The economic effectiveness (profitability ratio) of the third quintile (50/75%) was considerably higher than the fourth quintile with (75/100%), i.e. 31.4% and 14.9%. Arguably, the main reason for such discrepancy is that the reorganisation of farm enterprises, which took place in the mid 90ies, and therefore the division of property and land associated with the reorganisation, might have mechanically caused at times some increases in technical efficiency that did not combine with increases in economic effectiveness (profitability).

Specialisation	1995	2002	2008	% change (2008-1995)
Grain and technical crops	43.4	50.0	47.9	+10.4
Potato and vegetables	54.9	68.6	84.9	+54.6
Cattle	39.8	43.8	53.1	+33.4
Pig	63.6	62.9	65.5	+2.9
Poultry	56.3	55.6	59.3	+5.3

Source: Author's calculations

For the sake of simplicity, we divide all agricultural operators into quintiles. The first four groups comprised agricultural operators having technical efficiency scores of less than 1, the fifth group is the "best practice" group which includes farms with TE of 1. For all groups we calculate the profitability and revenue per each entity in the quintile, each average annual employee, 100 ha of arable land and 1000 roubles of the asset value. Results are presented in Tables 43-47 by type of production. Comparative analysis of results of technical efficiency and economic effectiveness (or profitability) calculation has shown that these two indicators change simultaneously, i.e. profitability grows with the growth of technical efficiency and vice versa. Therefore, considering that over the time period the profitability has grown, the technical efficiency has also improved. The transition to a market economy has forced farm operators to improve/increase production and increase competitiveness. However, it should be clearly understood that such change has differed among agricultural operators.

By 2002 the share of operators of the last quintile (100%) increased by more than 5%, but the profitability of the group dropped to 16.3%. The operation of operators of the first two quintiles, i.e. having technical efficiency scores below 50%, made losses, while the share of operators belonging to these groups reduced. In 2008, as compared to 2002, the overall profitability of operators increased, and was positive for all groups of producers. However, the share of operators with maximum technical efficiency and the share of operators having technical efficiency scores between 75 and 100% reduced. The majority of operators had low to medium (from 25 to 50%) TE, with a profitability ratio of 20%. Nevertheless, the growth of profitability in most groups was combined with increases in technical efficiency. This means that the market has positively responded to effectiveness gains on the whole and effectiveness gains in the use of each separate resource.

<b>Table 43: Economic effectiveness of operators specialising in growing grain and technical crops</b>						
	<b>Groups by technical efficiency</b>					<b>Total</b>
	<b>below 25%</b>	<b>from 25 to 50%</b>	<b>from 50 to 75%</b>	<b>from 75 to 100%</b>	<b>100%</b>	
<b>1995</b>						
Number of operators in the group	167	552	199	53	37	1008
Share of operators in the group, %	16.6	54.8	19.7	5.3	3.7	100
Profitability ratio, %	-40.3	0.0	31.4	14.9	72.0	9.6
Income: (million roubles)						
Per entity	670	1,789	3,526	3,741	4,574	2,151
Per average annual employee	3.4	6.5	9.7	13.2	17.5	7.7
Per 100 ha of arable land	12.5	27.7	46.9	70.3	102.9	33.9
Per 100 roubles of assets, roubles	5.0	10.2	17.7	21.4	32.4	12.5
<b>2002</b>						
Number of operators in the group	128	431	285	102	55	1001
Share of operators in the group, %	12.8	43.1	28.5	10.2	5.5	100
Profitability ratio, %	-32.3	-7.1	9.7	8.6	16.3	3.5
Income: (million roubles)						
Per entity	2,249	7,184	15,053	22,988	26,011	11,438
Per average annual employee	23.6	48.2	75.8	92.3	141.4	67.9
Per 100 ha of arable land	54.9	137.9	269.9	428.4	593.4	222.4
Per 100 roubles of assets, roubles	1.2	2.6	5.7	7.9	15.3	4.5
<b>2008</b>						
Number of operators in the group	99	501	258	65	45	968
Share of operators in the group, %	10.2	51.8	26.7	6.7	4.6	100
Profitability ratio, %	9.2	20.6	31.5	39.8	50.2	27.1
Income: (million roubles)						
Per entity	38,945	79,242	110,943	138,588	149,193	90,807
Per average annual employee	322.6	423.5	551.6	655.0	970.3	493.1
Per 100 ha of arable land	425.4	779.6	1,225.3	1,821.1	2,256.8	963.1
Per 100 roubles of assets, roubles	5.1	11.8	16.4	21.5	27.4	13.5

Source: Author's calculations

### Potatoes and Vegetables

Unlike farm operators specialising on other types of agricultural production, farms specialised in growing potatoes and vegetables have been operating in a highly competitive market environment. Indeed, they have had to face household plots, which mainly produce potatoes and

vegetables, for many years. Secondly, they compete with producers of the Commonwealth of Independent States as their borders were already open when the domestic market was developing in Russia. Foreign competitors have had longer experience of international competition, and consequently have rendered this market especially competitive as their costs of production have been much lower.

**Table 44: Economic effectiveness of operators specialising in growing potatoes and vegetables**

	Groups by technical efficiency					Total
	below 25%	from 25 to 50%	from 50 to 75%	from 75 to 100%	100%	
<b>1995</b>						
Number of operators in the group	23	75	54	20	30	202
Share of operators in the group, %	11.4	37.1	26.7	9.9	14.9	100.0
Profitability ratio, %	-44.3	6.6	24.2	58.5	55.1	26.7
Income: (million roubles)						
Per entity	622	3,068	5,420	7,064	7,185	4,425
Per average annual employee	3.1	9.4	15.3	18.1	24.6	13.8
Per 100 ha of arable land	34.5	105.6	217.6	316.6	534.9	186.8
Per 100 roubles of assets, roubles	3.6	12.1	21.1	28.3	32.4	18.5
<b>2002</b>						
Number of operators in the group	8	26	41	23	29	127
Share of operators in the group, %	6.3	20.5	32.3	18.1	22.8	100.0
Profitability ratio, %	-33.6	-1.9	13.2	20.9	35.7	21.2
Income: (million roubles)						
Per entity	1,279	7,051	19,097	40,415	35,641	23,147
Per average annual employee	13.6	61.1	96.7	146.0	180.2	122.8
Per 100 ha of arable land	94.1	369.1	811.8	1,529.4	2,100.6	1,101.1
Per 100 roubles of assets, roubles	0.5	2.3	5.0	6.9	7.7	5.6
<b>2008</b>						
Number of operators in the group		5	15	16	30	66
Share of operators in the group, %		7.6	22.7	24.2	45.5	100.0
Profitability ratio, %		2.2	28.4	35.9	33.6	31.5
Income: (million roubles)						
Per entity		40,590	68,436	62,102	109,695	83,545
Per average annual employee		417.6	481.3	435.6	709.2	578.0
Per 100 ha of arable land		2,462.4	3,098.8	2,421.4	5,299.7	3,815.9
Per 100 roubles of assets, roubles		4.0	8.4	10.0	14.5	11.0

Source: Author's calculations

Apart from 1995, the difference in profitability between the groups on each side of the range was extremely large. In the first two quintiles the share of agricultural enterprises (with technical efficiency ratio below 50%) amounted to 48.5%. By 2008 they accounted for only 7.6% of agricultural enterprises. In 2008, out of 202 existing operators in 1995, only 66 were left, i.e. less than  $\frac{1}{3}$ . By 2008 there were no operators with technical efficiency scores below 25%, and the share of technically efficient operators reached 45.5%. Obviously, these operators are characterised by the highest effectiveness of all resources compared to other technical efficiency groups.

### 3.2.2. Agricultural operators specialised in livestock rearing

Contrary to the situation with plant-growing agricultural producers, the profitability of the livestock rearing sector has regularly grown. For example, it has steadily increased for poultry farming operators, from -1.3% in 1995, to 4% in 2002, and finally to 14.3% in 2008; similar patterns can be observed for the profitability of pig breeding and cattle-breeding farms.

#### *Poultry Farming*

Changes in the number of operators within the different TE quintiles as well as in the efficiency of inputs show that

operators in the sector have also faced severe competition during the transition to the market economy. Out of 765 poultry farming operators, who were operational in 1995, only 285 (or just above  $\frac{1}{3}$ ) were left in 2008. Out of 40 poultry farming operators operational in 1995 from the first quintile, only 14 were left in 2002, and only 4 in 2008. Out of 283 operators having low technical efficiency scores in 2002 there remain 232 (82%), with a negative profitability rate of 7.3%. In 2008 the number of operators in the low TE group was 105, and all operators in the group were profitable

The comparison of estimated scores of technical efficiency and of the use of factors in 2008 reveals, among agricultural enterprises, significantly different strategies for further development: in the *best practice* quintile (with 100% technical efficiency), despite the maximum effectiveness of each of the used resources, the average revenue per entity is 348 million roubles, which is twice less than in the third and fourth quintiles. Therefore the problem of each producer lies in the strategy for further development, i.e. this decision can either be in favour of increases in technical efficiency, leading to the maximum effectiveness of resource use, or in favour of increasing the economic effectiveness, regardless of the excessive amount of resources. In addition, despite the fact that agricultural enterprises face such planning problems, their resolution lies far beyond the operations of a single entity, since it is also related to the development and improvement of market institutions.

<b>Table 45: Economic effectiveness of operators specialising in poultry farming</b>						
<b>Ratios</b>	<b>Groups by technical effectiveness</b>					<b>Total</b>
	<b>below 25%</b>	<b>from 25 to 50%</b>	<b>from 50 to 75%</b>	<b>from 75 to 100%</b>	<b>100%</b>	
<b>1995</b>						
Number of operators in the group	40	283	290	108	44	765
Share of operators in the group, %	5.2	37.0	37.9	14.1	5.8	100.0
Profitability rate, %	-54.7	-19.9	6.9	14.4	9.8	-1.3
Income: (million roubles)						
Per entity	3,401	8,812	14,841	21,156	20,233	13,214
Per average annual employee	10.4	21.8	33.1	38.8	45.2	30.1
Per 100 ha of arable land	517.9	884.7	1,339.5	1,354.4	2,892.0	1,219.5
Per 100 roubles of assets, roubles	5.8	19.2	34.1	47.0	61.0	29.5
<b>2002</b>						
Number of operators in the group	14	232	242	51	30	569
Share of operators in the group, %	2.5	40.8	42.5	9.0	5.3	100.0
Profitability rate, %	-57.3	-7.3	7.0	14.1	6.3	4.0
Income: (million roubles)						
Per entity	7,757	59,941	133,159	192,815	125,264	105,151
Per average annual employee	53.4	174.0	272.2	351.9	430.1	252.4
Per 100 ha of arable land	969.6	4,056.9	8,219.6	10,668.3	16,069.4	6,944.2
Per 100 roubles of assets, roubles	2.1	7.7	14.8	20.9	33.3	12.9
<b>2008</b>						
Number of operators in the group	4	105	118	30	28	285
Share of operators in the group, %	1.4	36.8	41.4	10.5	9.8	100.0
Profitability rate, %	-31.6	9.2	16.4	19.0	12.0	14.3
Income: (million roubles)						
Per entity	72,909	395,260	669,301	681,955	348,357	529,769
Per average annual employee	379.2	792.8	1,098.8	1,278.3	1,364.0	1,019.1
Per 100 ha of arable land	883,739.4	11,127.5	29,094.7	19,899.1	21,683.7	19,057.7
Per 100 roubles of assets, roubles	2.3	14.2	22.4	27.8	29.2	19.8

Source: Author's calculations

### Pig Farming

As indicated in Table 46, pig farming operators went through similar adjustments to those that affected poultry farming operators. These two sectors have faced common challenges. Large-scale livestock rearing operators are dependent on feed availability, its quality and price, and cannot rely on market institutions to address this issue. Due to the situation

of feed markets, such operators are forced to produce feed themselves, reallocating resources from their main operations and therefore reducing the technical efficiency of their main activities. This is implicitly suggested by Table 46, which shows that the revenues in the last quintile are more than twice less in comparison with third and fourth quintiles, which have higher effectiveness of resources.

<b>Table 46: Economic effectiveness of operators specialising in pig farming</b>						
<b>Ratios</b>	<b>Groups by technical efficiency</b>					<b>Total</b>
	<b>below 25%</b>	<b>from 25 to 50%</b>	<b>from 50 to 75%</b>	<b>from 75 to 100%</b>	<b>100%</b>	
<b>1995</b>						
Number of operators in the group	12	59	46	34	38	189
Share of operators in the group, %	6.3	31.2	24.3	18.0	20.1	100.0
Profitability ratio, %	-60.0	-19.7	2.3	12.8	13.7	3.3
Income: (million roubles)						
Per 1 entity	1,424	4,402	8,255	17,226	15,802	9,750
Per 1 average annual employee	6.6	12.0	20.4	30.7	36.1	23.5
Per 100 ha of arable land	144.3	130.3	224.8	768.3	1,101.5	360.8
Per 100 roubles of assets, roubles	4.2	9.4	18.8	26.6	29.2	19.5
<b>2002</b>						
Number of operators in the group	17	37	59	21	35	169
Share of operators in the group, %	10.1	21.9	34.9	12.4	20.7	100.0
Profitability ratio, %	-40.3	-14.5	5.4	12.4	18.6	9.0
Income: (million roubles)						
Per 1 entity	2,262	23,969	107,374	118,737	147,180	88,196
Per 1 average annual employee	33.3	98.9	225.5	299.1	326.7	239.2
Per 100 ha of arable land	197.3	846.8	3,871.3	4,563.0	4,730.8	3,302.0
Per 100 roubles of assets, roubles	0.8	4.3	10.6	17.1	14.8	11.1
<b>2008</b>						
Number of operators in the group	5	25	49	21	20	120
Share of operators in the group, %	4.2	20.8	40.8	17.5	16.7	100.0
Profitability ratio, %	-2.4	5.2	18.1	24.2	22.3	16.9
Income: (million roubles)						
Per 1 entity	131,597	306,205	469,353	491,394	245,649	387,864
Per 1 average annual employee	805.4	808.0	1,129.3	988.5	1,471.8	1,047.5
Per 100 ha of arable land	1,762.1	8,223.4	10,140.4	16,449.0	9,071.9	9,816.9
Per 100 roubles of assets, roubles	1.4	5.5	15.7	17.9	17.4	11.1

Source: Author's calculations

## Cattle Rearing

Most cattle rearing operators were making losses by the time the reform process started. Groups with very low and low technical efficiency (below 25 % and from 25 to 50%), or 73% of operators, had loss-making ratios of 40.5% and 12.8%. In 2002 the share of farms which increased their technical efficiency grew, along with a slight growth of profitability in groups having technical efficiency scores below 25%, from 25 to 50% and 100%. The difference in resource effectiveness between the groups with maximum technical efficiency and the fourth quintile with TE scores between 75 and 100% became less significant. In 2008, if compared to 2002, the number of unprofitable operators dropped, which can be partially associated with higher profitability in all

groups, except for the last quintile. Despite the increase in profitability the majority of operators (85%) fell under the category of operators with TE scores between 25 and 75%. The main problem of the Russian cattle rearing sector is that it is still regarded to be a multi-functional sector producing beef and dairy products. Unfortunately, the development of these two types of production in market economy conditions is often different, almost contradictory. While dairy production intensively uses all of its resources, whereas beef production follows the path of extensive development connected with the use of land. Overall, the analysis of technical efficiency scores of agricultural operators reveals situations in which substantial resources were inefficiently used, which can be partially attributed to poor management practices and the lack of development of market institutions in Russia.

**Table 47: Economic effectiveness of operators specialising in cattle rearing**

Ratios	Groups by technical efficiency					Total
	below 25%	from 25 to 50%	from 50 to 75%	from 75 to 100%	100%	
<b>1995</b>						
Number of operators in the group	286	443	186	51	34	1,000
Share of operators in the group, %	28.6	44.3	18.6	5.1	3.4	100.0
Profitability ratio, %	-40.5	-12.8	4.3	10.7	12.3	-9.5
Income: (million roubles)						
Per 1 entity	482	1,259	2,046	2,277	3,218	1,302
Per 1 average annual employee	3.5	6.2	8.1	9.9	14.3	6.6
Per 100 ha of arable land	18.1	36.5	53.3	74.9	144.4	40.3
Per 100 roubles of assets, roubles	4.0	8.3	11.6	13.3	24.0	8.8
<b>2002</b>						
Number of operators in the group	198	500	186	56	61	1,001
Share of operators in the group, %	19.8	50.0	18.6	5.6	6.1	100.0
Profitability ratio, %	-38.3	-10.0	2.2	9.2	14.3	-3.4
Income: (million roubles)						
Per 1 entity	1,703	6120	11,008	17,346	19,761	7,614
Per 1 average annual employee	22.2	43.3	64.3	94.3	129.0	55.5
Per 100 ha of arable land	80.7	212.2	312.1	464.2	802.0	265.0
Per 100 roubles of assets, roubles	0.8	2.2	3.8	4.9	8.4	0.28
<b>2008</b>						
Number of operators in the group	24	477	364	83	41	989
Share of operators in the group, %	2.4	48.2	36.8	8.4	4.1	100.0
Profitability ratio, %	-26.8	4.2	12.1	16.4	10.4	8.9
Income: (million roubles)						
Per 1 entity	18,988	35,420	53,044	78,138	61,613	46,179
Per 1 average annual employee	131.8	223.0	321.5	414.6	477.6	285.0
Per 100 ha of arable land	403.4	779.2	1,206.1	1,905.8	2,192.9	1,052.9
Per 100 roubles of assets, roubles	1.9	6.0	10.6	11.2	17.0	8.2

Source: Author's calculations

### 3.3. Financial sustainability of agricultural organisations

The financial sustainability of agricultural producers is critical in order to ensure any country's food security in the medium run. In fact, the improvement of the financial situation in Russian agriculture is one of the goals declared by the Government Program for 2008-2012 and of the approved Government Program for 2013-2020.

#### *Measures to support agricultural finance*

Those programs define the measures and ratios to assess the achievement of the objective. In particular, the current Government Program explicitly formulates the following:

- Profitability ratios (10% minimum),
- Share of operators making losses (30% maximum)<sup>50</sup>;
- Stable trend of overdue debt reduction.

The new Government Program for 2013-2020 foresees that the profitability should reach 15% by the end of the time horizon of the program, 2019-2020. It should be noted that the accepted target ratios do not give a comprehensive picture of financial sustainability; not only operators having profitable production and meeting timely their financial obligations can be considered financially sustainable, but also those having a reasonable degree of independence from creditors. The latter can be characterized by having:

- Sufficient level of own equity,
- Flexibility of equity,
- Good quality of assets and sufficient liquidity.

Therefore the official target ratios need be considered together with at least some additional balance sheet ratios. Similarly, the selected profitability ratio (i.e. 12-15%) must not be considered sufficient for the successful development of the sector and for the sustainable growth of production. It can rather be viewed as a temporary stage for the stabilisation of the sector.

Generally, all subsidies increase overall profitability and contribute to sustainability. However, the Government Program for 2008-2012 specifies the following actions as particular measures towards sustainability:

- Provision of tax benefits for agriculture;
- Revitalisation of agricultural operators following the Law "On financial revitalisation of agricultural operators";

- Improvement of access to credit by subsidising interest rates.
- The set of financial sustainability measures in the new Government program has remained the same, but the distribution of measures among sub-programs is now different. The first measure includes several tax benefits:
- For agricultural operators, which have not chosen to pay the Unified Agricultural Tax, the profit tax is 0% on activities related to sales of their products or sales of products, which they produced and processed. The benefit shall be valid between 2004 and 2020;
- For agricultural products, value added tax (VAT) rate is 10% (instead of 18%, applicable to other types of products);
- VAT exemption on agricultural products constituting in-kind payments for labour and also on products used for public catering services for agricultural workers;
- VAT is not charged when land (land share) is sold;
- Agricultural producers may switch to a specialised tax mode i.e. unified agricultural tax equalling 6% of cash revenue after deduction of costs. Operators paying the unified agricultural tax are exempt from profit tax, property tax, unified social tax and VAT.<sup>51</sup>

It was initially planned to gradually reduce tax exemptions. In accordance with the Tax Code, starting with 2013, the tax rate on profits for agricultural producers was to reach 18%, and starting with 2016 – 20%, i.e. no exemption. However, the Ministry of Agriculture has successfully lobbied for existing exemptions to remain at the same level, arguing that this decision will support the sector's adjustment to the WTO adhesion. The approved Governmental Program for 2013-2020 sets the goal of "ensuring that tax benefits for agricultural producers continue to be applicable during the implementation of the Government Program". From 2021, agricultural producers will then be expected not to benefit any tax exemptions.

The revitalisation of agricultural operators following the Law "On financial revitalisation of agricultural operators" started in 2002. The law was adopted in response to the insolvency of most agricultural organisations. The share of overdue accounts payable (including long-term and short-term loans and credits) in 2002 was 41% of the total accounts payable. Such situation has impeded the development of the sector. The main financial revitalisation measure included the restructuring of debt of agricultural producers, carried out by a standard procedure in every region. According to the Ministry of Agriculture, 13.2 thousand agricultural producers took part in the program from the start and until the end of

<sup>51</sup> Except for VAT payable when importing goods into the customs territory of Russia and VAT payable in connection a simple partnership agreement or trust administration of property agreement.

<sup>50</sup> For the program implementation period, i.e. 2008-2012.



2011. The total amount of restructured overdue accounts payable over the period was 87.4 billion roubles.

The economic environment, which does not allow anymore for the existence of enterprises making losses in the long-run, as well as a few regulatory measures of financial revitalisation and the improvement of credit opportunities, have contributed to the considerable improvement of the situation. In 2011 the share of operators making losses in the total number of agricultural operators in all regions of the Russian Federation reduced to 18%, and the share of overdue debt to 1%. That mainly happened in economically favourable regions, because the structure of production has changed. At the same time, a general revitalisation also took place. In 2011 there were only two regions with loss-making agricultural production<sup>52</sup> having 0.1% in domestic total revenues (i.e. Chechen and Ingushetiya Republics). The leading role was taken by the regions with profitability between 10.1 and 15%, which accounted for 47% of revenues. Regions of Russian Federation having profitability rates of over 15% increased their share in the total amount of cash revenues to 30% (Nefedova, 2008).

Therefore, the agrarian sector has gradually recovered after the mid-90ies crisis and has become more attractive for investors and entrepreneurs. Cheap credits contributed to the development of the sector. The program for subsidising interest rates, launched in 2006, covered a considerable number of organisations, helped many to avoid payment failures and the share of overdue debt gradually reduced. This seems to confirm that the measure on interest rates was indeed effective. However, such high level of credit availability to new investors and solvent agricultural operators (especially between 2006-2007 during implementation of the National Priority Project) has led to excessive borrowing, which could threaten the improved, but still fragile, financial situation of Russian agricultural organisations in the future.

### *Access to credit for agricultural operators*

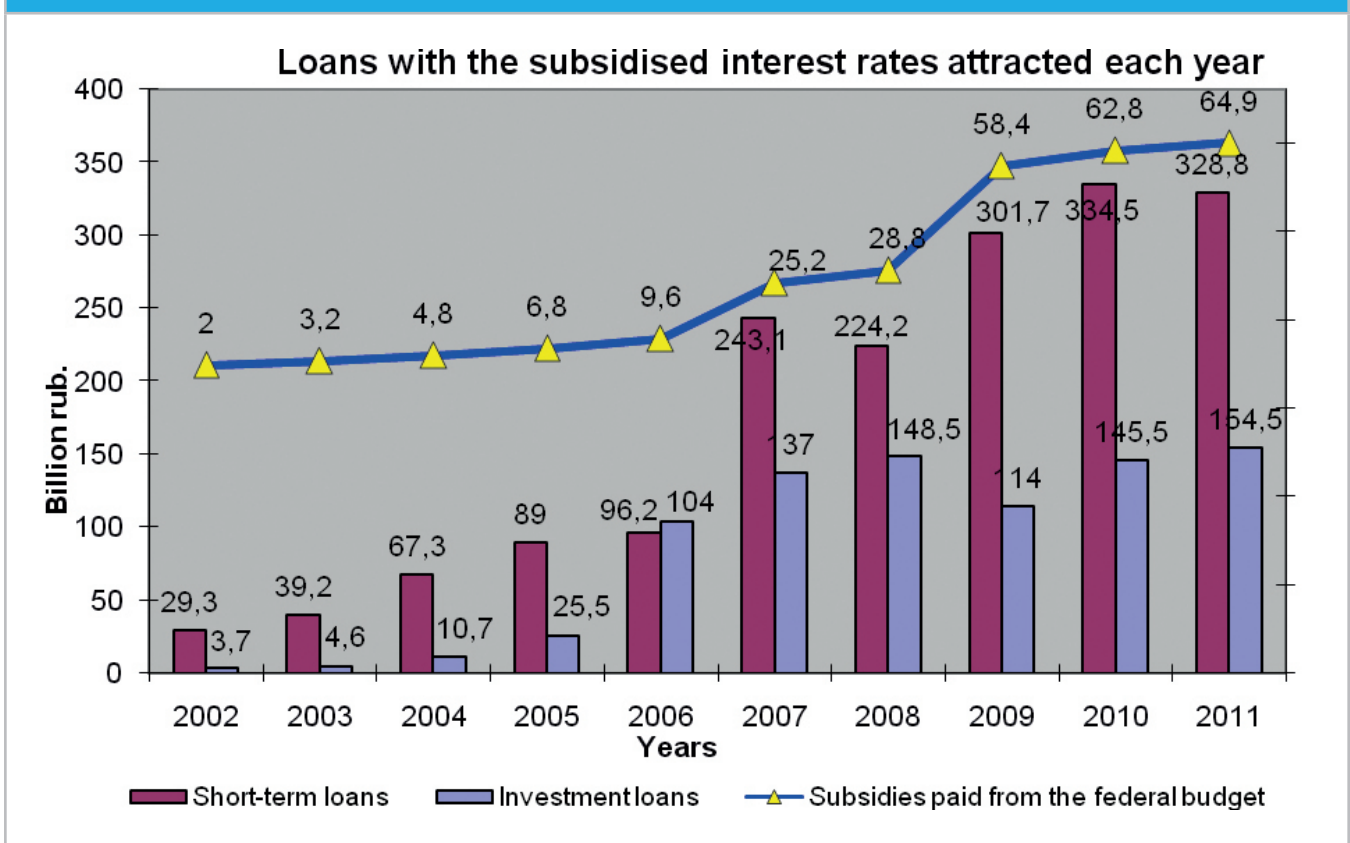
The agricultural sector needs finance to develop its production activities. However, the seasonality and risks combined with somewhat long production cycles, low profitability and dependence on price fluctuations require that special conditions are created to ensure the financial viability of farms. Subsidising interest rates on investment credits and short-term loans, which became popular in 2006, has improved credit accessibility and has increased the share of long-term borrowings in the total balance of agricultural operators. In 1996 this share was 1.2%, whereas in 2011 it amounted to 30.5%.

On a recent period, 2010-2012, the majority of loans have been subsidised as follows: the federal budget subsidises interest on target credits in the amount of 80% of the Russian Central Bank refinancing rate, regional budgets subsidise up to 20% of the Central Bank rate. Credits for livestock rearing have more favourable conditions (100% of the Central Bank rate from the federal budget and 3 points from regional budgets) and for minor agricultural operators (95 and 5% of the Central Bank rate). Starting in 2013, the share of federal funding will be reduced to 66% of the Central bank refinancing rate. Regional budgets will finance no more than 33%, but no less than 20% of the refinancing rate on most types of credits.

More favourable conditions still apply to agricultural operators involved in dairy farming - 80% of the refinancing rate from the federal budget and minimum 20% of the refinancing rate from regional budgets, and in meat farming - 100% refinancing rate from the federal budget and maximum 3 points above the refinancing rate - from the regional ones. Loan agreements, signed prior to 2013, retain the original conditions of subsidies. Since a number of new loans with subsidised interest rates are continuously added to loans of previous periods, the amount of subsidies required for managing these loans keeps growing (Figure 16).

<sup>52</sup> The profit is calculated before tax and includes subsidies.

Figure 16: Loans with subsidised interest rates



In 2011 (including loans of the previous periods) the total of 1,272.00 billion roubles has been accepted for crediting, of which 716.5 billion roubles are investment credits. The subsidies paid in 2011 from federal and regional budgets on investment and short-term loans (without subsidies to minor agricultural operators) amount to 76.0 billion roubles, including 11.1 billion roubles from regional budgets. Agricultural operators account for 54.5% of the total amount of loans with subsidised interest rates. This share has grown over the last 3 years (in 2009 – 50%, in 2010 – 52%). The second largest beneficiaries of such loans are processors of agricultural products. Their share is 44% in 2011 (in 2010 – 46%, in 2009 – 45%).

2011 has been characterized by moderate increases of activity on credit markets with subsidised interest rates. In 2011, beneficiaries of new investment loans with subsidised interest were mainly agricultural operators (processors) (81.3% of the amount of approved loans with subsidised interest rates). Agricultural enterprises account for 15.7% of new subsidised loans, family farms and private households for 3%. In 2011 the Government program has been financed by 85.4% from the government budget and by 14.6% from regional budgets. In addition, the Committee on Agricultural Loans regularly conducts meetings with leading banks, extending loans to agricultural operators, during which it has been recommended to take measures to reduce to 9-12% the annual commercial interest rates on loans extended to agricultural operators. In 2011 this objective has been met. Loans given to agricultural operators in 2011 have

substantially reduced (12.1%). This has allowed creating favourable conditions, in which agricultural operators were subsidised from the Federal budget in the amount of 80% of the CB refinancing rate, paid 5.6% annual interest on newly borrowed loans, and 4% annual interest on the loans for which the subsidies reached 100%.

The Government program for 2013-2020 will continue subsidizing the interest rates, but not as actively as at the start of implementation of the Priority National Project. The total amount of interest rate subsidies for investment and short-term loans (excluding loans of the previous period) for all the years of the Government program shall amount to 523.9 billion roubles (including 58.8 billion roubles for minor agricultural producers).

#### Natural disasters and insurance

Arguably, the volatility and risk of extreme weather events has grown significantly in recent years. Massive droughts have become particularly frequent. For example, in 2009, due to droughts, an emergency situation was announced in 16 republics of Russia. In 2010 another massive drought affected 43 regions, causing losses of agricultural crops on 13.3 million ha. In 2012 droughts occurred in 20 regions, reducing grain yields in these regions by about 12 million tonnes. These circumstances have required the allocation of additional funds from the government budget to deal with the consequences of these natural disasters. At the same time the share of insured agricultural operators has been

quite small, i.e. in 2011 20.1% of cropland producers were actually insured, whereas the target was at least 35%. This has led to the review of existing insurance principles.

On 25 July 2011 President Medvedev signed the Federal Law № 260- FZ “On Government Support in Agriculture and Amendment of the Federal Law “On Development of Agriculture””. The Law took effect starting on 1 January 2012. The new Law set forth the following principles:

- to insure only the risk of losses of over 30% of yields or over 40% of perennial crops;
- to provide support by paying the insurer 50% of the insurance premium;
- to establish a professional association of insurers, form a compensation fund, and set professional standards;
- to use agricultural insurance plans to determine the list of insured crops and rates for subsidy calculation;
- to establish rules for the accreditation of experts and loss assessment procedures;
- to establish the ceiling/amount of insurer’s account management costs (20% of the insurance premium);
- to extend support to livestock insurance starting 1 January 2013;

- To allow declaring insurance to be an eligibility condition for other types of government support.

The main counterpart for agricultural operators to participate in the government-supported insurance programs (except for private households and agricultural cooperatives) is that the authorities may require that all agricultural operators claiming federal budget support must have agricultural insurance.

### 3.4. Environmental Sustainability

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Agriculture may potentially have several adverse impacts on the environment due to, among many factors, the elimination of wildlife plants on crop land, ploughing and tillage, the application of mineral fertilisers and chemicals, land improvement activities, the excessive grazing load and contamination with livestock rearing waste. These ultimately result in the deterioration of soil ecosystems, loss of humus, disturbance of soil structure and soil consolidation, water and wind soil erosion. The use of chemicals and the storage of agricultural waste cause the contamination of surface and ground waters. Drainage and irrigation on large territories leads to the destruction of natural habitats of many species and increases the risk of fires. Tillage also destroys habitats of species and results in the deterioration of forest ecosystems.

**Table 48: Environmental sustainability vs. sustainability of agricultural development**

Measures for environmental sustainability	Measures for sustainability of rural development (actually implemented in Russia), legal basis
Stimulating reduction of arable land and forestation	Opposite effect: penalty, confiscation and sale of land for not using agricultural land (Federal Law “On Circulation of Agricultural Land”, RF Land Code, Administrative Violations Code)
Limits on agriculture, limits on the use of fertilizers and chemicals	Single cases of organic farming, no distinguishing between products of conventional and organic farming  Opposite effect: subsidies for more mineral fertilisers and plant protection chemicals
Restoring the natural water status	Opposite effect: increase of subsidies for land artificial improvement of agricultural land (Government Program for Support of Agriculture)
Prevention of loss of humus, normalisation of pH.	Prevention of fertility reduction, monitoring of agricultural land, RF Government Resolution #612 dd. 22.07.2011 approved criteria for soil fertility assessment. In case of fertility reduction, the land may be confiscated and given to another user (Article 6 Federal Law “On Circulation of Agricultural Land”)
Prevention of pollution, littering, contamination, disturbance and destruction of fertile soil	Similar effect, any damage to be compensated in case of pollution, littering, contamination, disturbance and destruction of fertile soil. The amount and procedure defined by the RF Government (The Federal Law “On Environmental protection”). Administrative liability is envisaged by the Administrative Violations Code: Article 8.3. Improper handling of pesticides and agrochemicals – a fine of up to 100 thousand roubles and arrest Article 8.6. Land disturbance – a fine of up to 40 thousand roubles and arrest Improper use of land, violation of obligation to prepare the land for proper use – a fine of up to 100 thousand roubles
Prevention of water pollution at water collection points	Similar effect – a fine of up to 30 thousand roubles and suspension of operations (Administrative Violations Code, Article 8.13)

Source: Federal Laws

In Russia, the issues of environmental sustainability of agriculture have always been given less attention than issues of sustainability (defined as stable and growing agricultural production). As a result, the set of environmental measures envisaged by the government differs from standard measures aimed at environmental sustainability (Table 48).

*Rosselkhoznadzor*, a specialized agency of the Ministry of Agriculture, is in charge of controlling the compliance of agricultural operators to these regulations and measures. Overall, inspected land areas are growing. In 2010, 5% of agricultural lands have been inspected and violations found on 12% of these lands. Following the inspections, land users have had to take measures (e.g. start cultivation or remove

open pits) and in 2010 this has facilitated gaining 386 thousand ha<sup>53</sup> of land back into agricultural production.

To retain and recover soil fertility, i.e. to involve more land in agricultural production and to facilitate a more intensive use of agricultural land, Russia has adopted a Federal Targeted Program “Soil Fertility” for the period from 2006 to 2013. The coordinator of the Program is the Ministry of Agriculture and other involved agencies are Federal Agency of Water Resources and the Russian Agricultural Academy. The goal of the Program is the preservation and rational use of agricultural land and agrarian landscapes to increase the volume of qualitative agricultural production. Table 49 shows the expected and actual outputs of the program.

53 RF MOA Data.

**Table 49: Spending under the Federal Targeted Program “Soil Fertility” in 2010**

	Ratio	Planned spend	Actual spend
1	Prevention of withdrawal of agricultural land from circulation, ths ha	600	990
2	Involvement into circulation of abandoned agricultural land, ths ha	200	320
3	Involvement into intensive circulation of Chernobyl affected lands, ths ha	26,4	26,6
4	Protection from water erosion, flooding and saturation, ths ha	26	108,7
5	Protection and conservation from wind erosion and desertification, ths ha	122	302,2
6	Application of mineral fertilisers, mln tonnes of active substance	1,8	2,28
7	Involvement into circulation of land following land improvement, ths ha, including:	35	58,7
8	Rehabilitation of irrigated land, ths ha	600	990
9	Rehabilitation of drained land, ths ha	200	320

Source: RF MOA, 2010

These environmental measures have been funded by the government, at different institutional levels. Expenditures in 2010 have amounted to 77.6 billion roubles (16.17 – from the federal budget, 12.25 – from regions, 49.2 – off-budget sources (i.e. contributions of local population). For instance, the increase of the use of mineral fertilisers has jointly been subsidised by both federal and regional budgets. The level of support greatly has varied according to product specialisation: for example, in 2010, it could go from 275.00 roubles/ha (grain) up to 1,275.00 roubles/ha (beetroot, potato). The analysis of environmental measures shows that Russia has gradually developed and implemented environmental protection measures contributing to the environmental sustainability of agriculture. Yet, measures facilitating a more intensive use of natural resources for agricultural production still prevail over the measures for preserving the natural resources, mainly land areas.

### 3.5. Concluding remarks

- i. The analysis of the economic effectiveness of agricultural producers has shown that the effectiveness of land use is highest for household plots. This is mainly explained by the specialisation of household plots on more intensive crops (e.g. potatoes, vegetables, fruits and berries) with higher costs of products per ha, while extensive crops are mainly grown by agricultural enterprises and family farms.
- ii. Until 1998, agricultural output decreased faster than employment. As a result, labour productivity dropped. Since 1998 the increase in output occurred simultaneously with the decrease of employment. This allowed labour productivity gains. These patterns have been heterogeneous across time and between operators.
- iii. The economic and technical efficiency of agricultural enterprises has increased between 1995 and 2008: grain and crops (+10.4%); potato and vegetables (+54.6%); cattle (+33.4%); pig (+2.9%) and poultry (+5.3%). The transition to a market economy has forced farm operators to improve competitiveness, particularly, by focussing on the most profitable types of products.
- iv. In the grain and technical crop sector, agricultural enterprises have simultaneously experienced profitability and technical efficiency gains; yet the sector is not very efficient and much potential for improvement exists. The potato and vegetable sector is very efficient and competitive.
- v. The poultry sector has suffered from significant restructuring during the transition as the competition has been fierce. In the pig farming sector, the access to reliable feed markets have structurally hindered their capacity to be efficient as the reallocation of resources has affected their main activities. Similarly, the issue of multifunctionality has also affected the cattle sector, as it is often contrary to their most efficient practices.
- vi. Overall, the efficiency of agricultural enterprises across the sectors is also dependent on the development of strong market infrastructures and management practices.

- vii. The financial situation of agricultural enterprises, which were crippled with debt, has also improved due to the reduction in the use of unfavourable territories, the reorganisation of production and the implementation of government measures.
- viii. Restructurations in the agricultural sector and improvements in the overall's sector financial sustainability have allowed many farms to become profitable and have made the agricultural sector attractive to investors.
- ix. In a financial context that remains relatively fragile for many farms, credit subsidies, especially those targeted at short-term loans, have significantly increased in recent years and have been mainly given to agricultural operators and processors of agricultural products.
- x. While Russia has developed and uses environmental protection measures, which are likely to improve the environmental sustainability of agriculture, measures stimulating the intensive use of natural resources for agricultural production still largely prevail over measures of land preservation.

## 4. Drivers of food security in Russia and contribution to global food security

The changing situation of Russian agriculture over the 20 years, particularly in terms of legislation (Chapter 1) and the analysis of economic, financial, technical and environmental performance of agriculture (Chapter 2) allow understanding the economic and policy background in which the agricultural sector has been operating in Russia and how it has affected the farming structure and farming operations. Given this background, the objective of this chapter is to study the main factors that affect the potential for ensuring domestic food security and its contribution to global food security. Specifically, it provides detailed simulations on the potential of putting abandoned agricultural land to use in order to increase grain exports. Chapter 3 also provides forecasts of crop and livestock yields and a comparative analysis of crop and livestock yields in Russia and other countries. This chapter finally examines agricultural best practices in Russia and food growth potential through upgrading the machinery and production processes and the implementation of more rational government support policies.

### 4.1. Resuming agricultural operations on abandoned land

Total area of abandoned land, i.e. agricultural land which is not used for agricultural production, includes:

State-owned land, which is not used by any agricultural operators. As a rule, there is no demand for such land from agricultural operators. The State cannot give the land to agricultural operators, as the procedure of land allotment is costly and neither regional nor municipal budgets have enough funds to pay for it. The area of such land has been steadily increasing over the recent 20 years (Table 50).

Land owned, leased or transferred into the use of agricultural operators, which they actually do not use. Such land is not captured by statistics. Expert estimates of academics and politicians vary significantly: from 20 to 40 million ha.

**Table 50: Agricultural land area in Russia (million ha)**

	1970	1980	1990	1995	2000	2005	2010
Agricultural land, total	233.9	229.9	222.1	221.0	221.1	220.7	220.4
Allocated to agricultural operators	222.0	219.0	213.8	209.6	197.0	191.7	190.8
Not allocated to agricultural operators	11.7	10.9	8.3	11.4	24.1	29.0	29.6

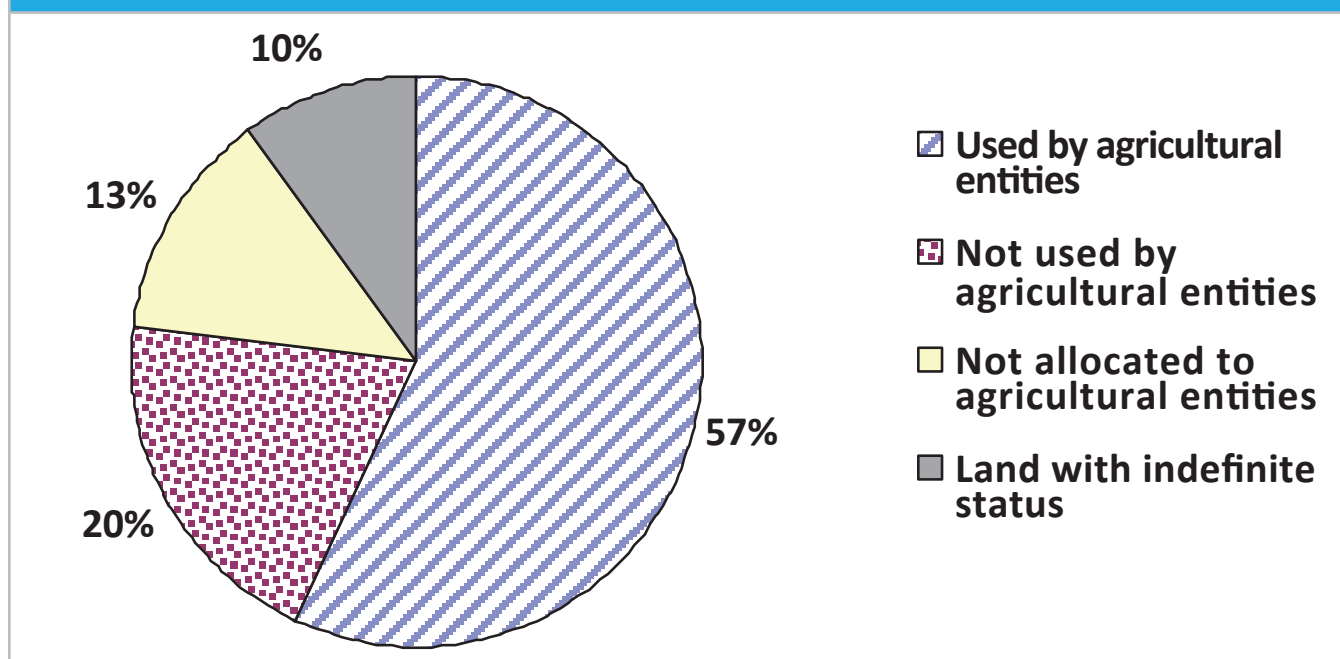
Source: RF land fund as 1.1.2010, Rosreestr.

The area of unused agricultural land is estimated using data of the Russian Agricultural Census of 2006. The census covers 36.9 million of agricultural operators. About 6 million of them have not been involved in agricultural production (19 thousand agricultural enterprises, 139 thousand family farms, 2.6 million household plots, 3.2 million of orchard and garden owners). These operators nominally controlled 23.3 million ha of agricultural land. In addition, some agricultural operators, which actually produced agricultural products, did not use part of their agricultural land either. The area of such land represented about 20.5 million ha. Therefore, in 2006, agricultural operators did not use 43.8 million ha of agricultural land, while the total area of unused land, including state-owned land not given to agricultural producers, amounted to 73.6 million ha, i.e. 33.4% of all agricultural land in the country.

To analyse the quality of abandoned land, we have grouped all regions by the percentage of land that is not allocated to any agricultural operators (Table 51) and grouped regions by their bioclimatic potential<sup>54</sup>. The area of unused agricultural land is determined on the basis of the 2006 Russian National Agricultural Census data.

Table 51 shows that in the thirteen regions where almost all lands are somehow allocated to agricultural operators, the average bioclimatic potential equals 109 points, whereas in the 20 regions where 43.5% of agricultural land is not allocated to agricultural operators, the average bioclimatic potential equals 83 points, i.e. with many abandoned lands with low bioclimatic potential. Therefore, there is a strong correlation between the bioclimatic potential and the proportion of land allocated to agriculture.

**Figure 17: Use of agricultural land in Russia, 2006**



**Table 51: Regions grouped by proportion of land not allocated to agricultural operators**

Regions grouped by proportion of land not allocated to agricultural operators	Number of regions	Average proportion of not allocated agricultural land	Average bioclimatic potential
below 5%	13	3.2	109
5-15%	24	8.0	103
15-25%	19	19.6	88
above 25 %	20	43.5	83
Total	76	13.5	98

Source: calculations based on the data of the RF land fund as of January 1, 2010, Rosreestr 2010

<sup>54</sup> Bioclimatic potential assessments of regions have not been updated for several recent decades. We used the data published in Shashko (1975).



### Main reasons for withdrawing land from agricultural use

The main reason is obvious in Northern, Eastern and semi-desert areas, i.e. unfavourable natural and climatic conditions. This is confirmed by Table 51, showing the relation between land withdrawal from use and its bioclimatic potential. The development of agriculture and the use of agricultural land are also significantly affected by migrations in rural areas and between rural and urban areas, which directly affect the rural population. In any region in Russia, where rural population is rapidly decreasing and where there is a downturn in agriculture (Table 52), agricultural land has been withdrawn from use.

amounted to 80-83% of production costs and exceeded the level of support in the USA or the EU (OECD, 1998). Following the transition to a market economy, the level of support has reduced to a bit less than 10%. In 1992-1994 and in 1999 the support was even negative, i.e. the state did not support the agricultural operators, but it collected their revenue into the government treasury. Thus, agricultural businesses have stopped unprofitable operations and use of land located in areas with low bioclimatic potential.

If agricultural businesses had continued to use land in unfavourable natural and economic conditions, additional products would have been produced and delivered to the

**Table 52: Regions grouped by population size index (2009 vs. 1990)**

Regions grouped by population size index, 2009 vs. 1990, %	Number of regions	Average rural population size index, 2009 vs.1990, %	Index of physical volume of agricultural products, 2009 vs. 1990, %
Below 80	14	74.9	73.4
80-100	36	90.3	83.1
Above100	26	112.4	95.1

Source: calculation made on the basis of EMISS Rosstat database, 1990-2009

In the areas with numerous abandoned lands, family farmers who stop operations can neither sell nor lease their land and end up leaving it idle<sup>55</sup>. In such areas, most land share owners have no opportunity to allot their land in-kind and use, lease or sell it, i.e. there is no demand for land shares<sup>56</sup>. In Russia, the withdrawal of agricultural land from use is viewed by many academics and politicians as a very negative trend. It leads to the reduction of agricultural production and rural employment and the increase in weed infestation and forestation of agricultural land. In fact, the extent of the problem is such that it is viewed as a potential threat to the country's food security. Therefore, the logical implication from such assessment would be that agricultural lands must be brought back into circulation and that rural people must become involved in agricultural production.

In order to assess the economic viability of such recommendations, one needs to take into account that land involvement into agricultural circulation was determined in the Soviet economy by planning. There existed some a priori loss-making agricultural operators and the State compensated for their losses. Also, government purchase prices for agricultural products in the USSR were differentiated in such a way that even in the least efficient areas, inefficient farmers (in terms of production costs) were compensated. According to OECD estimates, between 1986 and 1988, the level of State support to agriculture

market. We might assume that in a context of sharply reduced incomes during the reform process, it would have led to a drop in agricultural prices and would have caused the insolvency of, not only enterprises using land with low return, but also many others. Also, in the Soviet times land was given to collective and state farms for free and unlimited use. In the presence of normal market conditions, such unviable mechanism does not exist. Land and other resources shall pass from less effective users to more effective ones. However, such transmission is easier when transaction costs are low or nil. The latter have been indeed relatively low in Russia at the beginning of the reform, but have grown during the 2000's and have become an overwhelming barrier, especially for small businesses.

Furthermore, significant areas of unused land were formally owned or used by agricultural operators which were abandoned, stopped their operations, but still existed from a legal viewpoint. These were former collective and state farms and production cooperatives, joint-stock companies and limited liability companies, that became insolvent and actually bankrupt, but did not go through bankruptcy and liquidation procedures and their land was not transferred to other users. Bankruptcy procedures are costly and require funding from the State or private investment. Federal, regional and municipal budgets have never allocated any money for this purpose, for business investors such expense in most regions would not have been recoverable, and those lands have therefore remained unused.

<sup>55</sup> Russian National Agricultural Census data showed that in 2006 there were 4.8 million ha of such land

<sup>56</sup> According to the agricultural census, such lands are about 7.1 million ha

### *Cultivating abandoned lands*

Many politicians and academics have on many occasions expressed the opinion that Russia has millions ha of unused agricultural land, which can be put back to use to partially increase their export potential and therefore could lessen the global food challenge. For this purpose it is proposed to bring the abandoned land back into circulation and drastically increase the area of cropland. When assessing Russia's potential for cultivating abandoned land, there are, however, a few facts, which should be taken into account:

- i. The withdrawal from agricultural use of less valuable land is a normal phenomenon in market economies. Even in Europe where land is a limited resource, from 1961 to 2003, 25.1 million ha of agricultural land have been withdrawn from circulation (laid up), in the USA – 35.6 million ha, in Australia – 40.8 million ha, worldwide – 223 million ha. The abrupt reduction of used agricultural land has also occurred in Eastern Europe upon the transition to a market economy;
- ii. In developed economies, there are policies stimulating the withdrawal of land, which may give access to subsidies for agricultural operators for each ha of unused land. Within that context, proposals to pay subsidies in Russia for involving more land into agricultural circulation directly contradict the global trend;
- iii. Proposals to increase crop land in Russia are not based on the analysis of global practices. The rate of land tillage in Russia is twice as much as in Germany, where land is a limited resource. It is doubtful that Russia should plough more land. The practice of other countries shows that it is reasonable to keep a significant share of agricultural land as cultivated grassland and hayfields;
- iv. Arguably, a significant part of global food security issues does not lie in the physical lack of food, but rather relates to the economic access of the poorest part of the world's population; as a result, the emphasis should be put on strategies that focus on increased incomes, employment opportunities, or decreased food wastes through food systems.
- v. Russia has some potential to increase food production and export, through the involvement of abandoned lands. Yet, it should be noted that bringing such lands bank into circulation in Russia may be much more expensive and less effective than in the EU, the USA and many other countries for several reasons. First, land withdrawn from circulation in Russia is in its quality and bioclimatic potential worse than land available in Europe or North America. Then, land was withdrawn from circulation in the EU and the USA by operating farmers.

If the market situation is favourable, they can easily start cultivating such land, especially as they own idle machinery power and labour. Similarly, Russia has also operational agricultural organisations, which may start cultivating more land. But the majority of abandoned land is located near abandoned agricultural operators and abandoned villages. In order to bring such land into circulation, in many cases it will be required to start with re-settling people, establishing new operators, buying machinery and equipment, development of weed infested and forested land. All this would require significant long-term investments and political will.

To sum up, Russia has over 70 million ha of abandoned agricultural land, but it is mainly located in areas with low bioclimatic potential. This land mainly belongs to non-operating agricultural enterprises, family farms and household plots located in the Northern and Eastern areas and in the Non-black soil zone. The initial reasons for the withdrawal of these areas are the low effectiveness of such land, as well as difficulties with allotment, registration and sale/purchase. In order to use abandoned land, policies must aim at reducing transaction costs for its allotment, registration thereof as property or leased asset, sale/purchase, as well as ensuring that agricultural operators are protected from confiscation of property, abuse of power by officials and general bureaucracy.

When assessing Russia's potential to help addressing the global food problem by means of cultivating abandoned land, it is necessary to perform a simulation analysis of such political decision. Before subsidising the cultivation of abandoned land, it is necessary to perform in each region an assessment of the effectiveness of such additional investments. In other words, investing into wild and fallow land could be justified if and only if the returns would be significantly higher compared to more traditional investments into old arable land.

## **4.2. Assessing the potential for Russian grain export**

Russia is one of the largest grain exporters in the world. The country's grain export has been growing while at the same, land areas under grain have been reduced. Prime Minister Medvedev has recently assessed the potential for increasing the country's export by saying that Russia will feed the world<sup>57</sup>. Russia's potential to increase agricultural production is viewed primarily with respect to the availability of large areas and unused agricultural land. This section attempts to evaluate the potential for increasing grain export at regional level, not only on the basis of available land, but also on the basis of production costs, transport costs to export terminals and global grain prices.

57 <http://vz.ru/news/2013/1/24/617280.html>

#### 4.2.1. The reduction in Russian grain crop area

The shift from the soviet-time centrally planned agriculture to the free market was accompanied by a decrease in arable land areas and in the total land area under crops, which included grain crops.

##### *Arable Land and Cropland Area: a country-level perspective*

In the last twenty years, arable land area in Russia has reduced by 16.5 million hectares, i.e. 12.5% (base 1990). Total land area under crops has reduced by 42.4 million hectares, among which land area under grain crops has

decreased by about 20 million hectares. However, while the share of land area under crops in total arable land areas has reduced from 89.2% to 65.2%, the share of land under grain crops in total cropland areas has increased from 53.6% to 57.4%.

The reduction of land area under grain crops has been a common feature across almost all regions in Russia, but the extent of the phenomenon has been greater in regions with less favourable physical and economic conditions, having low bioclimatic potential, high costs per tonne of output and low yields (Tables 54 and 55).

**Table 53: Arable land and cropland area in Russia between 1990 and 2010**

	1990	1995	2000	2005	2010	2010 vs. 1990	
						mln ha	%
Arable land, mln ha	131.8	127.6	119.7	116.1	115.3	-16.5	87.5
Cropland, mln ha	117.6	102.5	85.4	77.5	75.2	-42.4	63.9
Share of cropland in the arable land, %	89.2	80.3	71.3	66.8	65.2		
Grain cropland area, mln ha	63.0	54.7	45.6	43.4	43.2	-19.8	68.6
Share of grain crops in the total cropland, %	53.6	53.4	53.4	56.0	57.4		

Source: Annual Russian Statistics. Official publication. 2006, 2011.

**Table 54: Profitability of agricultural enterprises**

Region	All Agricultural Operators			Agricultural Enterprises		
	1990	2010	2010 vs. 1990 Ths ha %	Average yield in 2008-2010, hwt/ha	Average cost in 2008-2010, roub./tonne	Profitability %
Russian Federation	62,869	43,194	-19,674 -31.5	19.5	3,566	17.6
Belgorod Region	718	614	-104 -14.5	29.4	3,856	3.6
Bryansk Region	622	315	-307 -49.4	16.8	3,294	7.2
Vladimir Region	293	84	-210 -71.4	17.5	4,533	12.3
Voronezh Region	1,518	1,086	-432 -28.5	23.1	3,362	6.8
Ivanovo Region	279	68	-212 -75.8	15.0	4,222	6.9
Tver Region	622	74	-548 -88.1	12.8	5,031	-7.2
Kaluga Region	370	75	-295 -79.8	19.8	4,199	13.7
Kostroma Region	287	52	-235 -81.9	11.3	5,907	-12.4
Kursk Region	966	895	-71 -7.4	27.6	3,362	14.8
Lipetsk Region	848	760	-89 -10.5	29.0	3,408	12.5
Moscow Region	286	85	-201 -70.2	24.7	4,615	-0.2
Oryol Region	908	782	-126 -13.9	26.6	3,396	9.0
Ryazan Region	901	501	-400 -44.4	24.7	3,283	25.4
Smolensk Region	611	87	-524 -85.8	14.4	4,603	3.0
Tambov Region	1,165	818	-348 -29.8	23.6	3,205	7.6
Tula Region	818	515	-304 -37.1	24.1	3,489	16.6
Yaroslavl Region	316	48	-269 -84.9	15.5	5,107	5.0
<b>Total, Central Federal District</b>	<b>11,530</b>	<b>6,856</b>	<b>-4,674</b> <b>-40.5</b>	<b>24.7</b>	<b>3,481</b>	<b>10.4</b>
Arkhangelsk Region	84	2	-82 -97.4	15.4	8,858	20.8
Vologda Region	288	134	-154 -53.5	15.3	5,121	2.9
Kaliningrad Region	184	64	-120 -65.2	33.5	4,711	14.2
Leningrad Region	37	32	-5 -14.5	27.8	5,157	-2.0

Region	All Agricultural Operators				Agricultural Enterprises		
	1990	2010	2010 vs. 1990 Ths ha	%	Average yield in 2008-2010, hwt/ha	Average cost in 2008-2010, roub./tonne	Profitability %
Murmansk Region	0.3	0.0	-0.3				
Novgorod Region	151	12	-139	-92.3	15.0	7,075	-15.2
Pskov Region	281	18	-263	-93.7	13.7	7,007	-6.1
Karelia Republic	0.4	0.1	-0.3	-76.2	16.7	6,491	24.6
Komi Republic	0.6	0	-0.6	-100.0	16.2	7,006	
Total, North Western Federal District	1,026	261	-765	-74.6	21.2	5,135	5.0
Krasnodar Krai	1,976	2,155	179	9.1	47.1	3,526	37.5
Astrakhan Region	164	23	-141	-86.0	18.6	7,108	10.2
Volgograd Region	2,670	1,619	-1,050	-39.3	17.2	3,239	15.8
Rostov Region	2,941	2,823	-118	-4.0	25.6	3,323	19.9
Adygeya Republic	120	114	-5	-4.6	40.8	2,966	23.1
Kalmykiya Republic	403	217	-187	-46.3	15.5	3,144	24.2
Stavropol Krai	1,792	2,139	347	19.4	33.4	3,276	25.0
Ingushetiya Republic		39	39		14.7	4,787	-16.4
Dagestan Republic	221	104	-117	-52.9	21.5	4,540	0.5
Kabardino-Balkariya Republic	152	176	24	15.5	33.7	3,608	16.5
North Osetiya Republic	109	108	-1	-1.1	39.5	3,779	5.7
Karachayevo-Cherkessiya Republic	62	58	-4	-6.4	22.2	4,246	-11.5
Chechen Republic		102	102		13.8	5,820	-26.5
Total, Southern Federal District	10,610	9,677	-933	-8.8	30.7	3,374	26.4
Nizhny Novgorod Region	1,071	563	-508	-47.5	18.7	4,163	4.9
Kirov Region	1,186	327	-859	-72.4	16.3	3,916	17.0
Samara Region	1,599	990	-609	-38.1	10.3	3,570	17.0
Orenburg Region	3,754	2,808	-946	-25.2	7.9	3,795	21.6

Region	All Agricultural Operators				Agricultural Enterprises		
	1990	2010	2010 vs. 1990 Ths ha	%	Average yield in 2008-2010, hwt/ha	Average cost in 2008-2010, roub./tonne	Profitability %
Penza Region	1,359	640	-719	-52.9	15.0	3,568	5.4
Perm Kray	923	285	-637	-69.1	13.0	4,573	10.0
Saratov Region	3,371	2,224	-1,147	-34.0	10.5	3,534	11.4
Ulyanovsk Region	983	596	-387	-39.4	13.8	3,771	11.7
Bashkortostan Republic	2,594	1,761	-833	-32.1	15.3	3,948	7.7
Mariy El Republic	318	141	-177	-55.6	13.3	3,904	11.0
Mordoviya Republic	658	430	-228	-34.6	21.3	3,827	11.3
Tatarstan Republic	1,955	1,512	-442	-22.6	22.3	4,178	1.9
Udmurtiya Republic	739	416	-323	-43.7	12.9	4,093	10.4
Chuvashiya Republic	402	253	-148	-36.9	16.5	3,831	9.5
Total, Volga Federal District	20,911	12,947	-7,964	-38.1	13.5	3,886	9.7
Kurgan Region	1,565	1 119	-446	-28.5	12.1	3,919	18.1
Sverdlovsk Region	710	350	-360	-50.7	15.7	4,637	4.3
Tyumen Region	903	708	-195	-21.6	18.9	4,190	-2.2
Chelyabinsk Region	1,479	1 471	-8	-0.5	8.8	4,291	14.6
Total, Ural Federal District	4,657	3,648	-1,009	-21.7	12.5	4,192	9.3
Altay Kray	3,998	3,394	-604	-15.1	12.5	3,257	32.5
Buryatiya Republic	357	107	-250	-70.0	8.5	4,573	28.4
Krasnoyarsk Kray	1,652	978	-674	-40.8	22.3	3,371	25.9
Irkutsk Region	727	358	-369	-50.8	16.8	4,169	16.5
Kemerovo Region	699	684	-15	-2.2	19.3	3,255	23.3
Novosibirsk Region	1,977	1,561	-416	-21.0	16.5	3,090	28.1
Omnsk Region	2,055	1,894	-161	-7.8	14.1	3,404	12.5
Tomsk Region	288	240	-48	-16.6	15.7	4,195	4.1

Region	All Agricultural Operators				Agricultural Enterprises		
	1990	2010	2010 vs. 1990 Ths ha	%	Average yield in 2008-2010, hwt/ha	Average cost in 2008-2010 roub./tonne	Profitability %
Zabaikalsk Krai	932	152	-780	-83.7	12.1	3,425	16.2
Altay Republic	39	9	-30	-76.4	9.5	3,120	37.7
Tyva Republic	146	18	-128	-87.6	8.9	6,850	-20.8
Khakasiya Republic	312	91	-221	-70.8	12.2	4,711	6.0
<b>Total, Northern Federal District</b>	<b>13,182</b>	<b>9,485</b>	<b>-3,697</b>	<b>-28.0</b>	<b>15.1</b>	<b>3,360</b>	<b>23.8</b>
Primorsk Krai	229	80	-149	-65.0	16.4	6,633	4.9
Khabarovsk Krai	18	6	-12	-66.0	14.2	7,656	-4.3
Amursk Region	637	204	-433	-68.0	10.4	4,660	-2.3
Kamchatka Krai	0.0	0.3	0.3		8.3		
Sakha (Yakutiya) Republic	24	15	-9	-36.3	5.8	12,704	-49.7
Jewish Autonomous Area	44	15	-29	-66.9	10.7	5,946	4.4
<b>Total, Far Eastern Federal District</b>	<b>953</b>	<b>321</b>	<b>-632</b>	<b>-66.4</b>	<b>11.8</b>	<b>5,654</b>	<b>-1.7</b>

Source: EMISS Rosstat database, Annual Summary Reports: Form 9 AIC, 2008-2010

### Regions by grain cropland changes

Between 2010 and 1990, the grain cropland area has only grown in three regions of the Southern Federal District (i.e. Krasnodarsky Kray, Stavropolsky Kray and Kabardino-Balkarskaya Republic). In regions where grain cropland areas have grown, the average yield in 2008-2010 has been 40 hwt/ha, and the profitability had reached 32%, for a net cost

per grain tonne of 3,429 roubles. In those regions where the reduction has been below 20%, yields and profitability have been already twice as little. In the 11 regions, where grain cropland area has reduced by over 80%, yields have been 3 times as little, whereas net costs have been 1.5 times more than in the first group. Grain-growing in these regions is not profitable.

**Table 55: Classification of regions by Grain Cropland Area Changes between 1990 and 2010**

Groups by % change of grain cropland area	Number of regions	Change of Grain cropland area in 2010 compared 1990		Grain yields 2008-2010	Agricultural Enterprises	
		Ths.ha	%		Cost per tonne of grain	Sales profitability 2008-2010
Above 0	3	550	14.0	40.0	3,429	32.0
-20/0	14	-1,361	-8.9	19.3	3,440	17.0
-40/-20	16	-7,941	-30.6	15.3	3,639	11.5
-60/-40	12	-4,295	-47.7	18.2	3,729	14.3
-80/-60	15	-3,658	-70.9	15.4	4,544	10.0
-80 and lower	11	-3,110	-86.5	13.2	4,909	1.5
Total	71	-19,815	-31.5	19.5	3,566	17.6

Source: author's calculations based on Rosstat data



Using data of Table 53, we have calculated the following regression equation: xxx

$$s = a_0 + a_1z + a_2r$$

Where:  $s$  is the change of grain cropland area in 2010 against 1990 (for all categories of agricultural operators, %); the variance of net cost per tonne of grain at an agricultural enterprise in the given region against such average value

for Russia (2008-2010, %);  $r$ , grain profitability level at an agricultural enterprise (2008-2010, %). Calculations are made for the totality of regions, which had grain-selling agricultural enterprises (75 regions). Estimation results<sup>58</sup> give the following predicting equation:

$$Y = 55.779 + 0.588r - 21.401\ln(x+50); R^2 = 0.616; F = 20.496$$

With  $x$ , profitability<sup>59</sup>.

Table 56: Regression results			
Y	Coefficients	t-statistics	P-value
Constant	55.779 (22.707)	2.456	0.016
$r$	0.588 (0.092)	6.375	0.000
$\ln(x+50)$	-21.401 (5.216)	-4.103	0.000

Notes: standard errors in parentheses.

Table 57: Coefficients of correlation				
	Change of land area	Yield 08_10	Net costs of grain 08-10	Profitability
Change of land area, %	1			
Yield 08-10, hwt/ha	0.536	1		
Net cost of grain 08-10 (roubles/tonne)	-0.493	-0.344	1	
Profitability %	0.261	0.2790	-0.640	1

58 Equation coefficients were estimated using the Statistics-9 package.

59 50-is the invariable, added to the values of average profitability level in all groups, in order to eliminate negative profitability values, which impeded the calculation of  $\ln$ .

All other regions have faced a reduction in grain cropland areas varying from some a partial decrease to a total liquidation of grain area (e.g. North-Western Federal District). As shown in Table 55, the grain cropland area has reduced in those regions where yields have been less than 20 hwt per hectare, and production costs per 1 tonne of grain have exceeded 3,429 roubles. There is a correlation of higher costs and lower sales profitability with more grain cropland area reduction.

#### 4.2.2. Methodology to assess the potential for Russian grain export

The methodology includes the existence of multiple factors that they may affect the capacity of the agricultural sector to put back the abandoned land back into use; in particular, transport costs are fully integrated to the analysis. For the purpose of this assessment we assume the following conditions. Such conditions, when observed, enable expanding grain cropland area in Russian regions:

Grain growing in a region is profitable, if the selling price at the port of shipment after deduction of the cost of railway transport from the regional central railway terminal to the port exceeds the cost of production and sales: , where : sales price per tonne of grain at the port; : transport costs for delivery to the nearest port per tonne of grain; : cost per tonne of grain sold. Therefore, when accounting for transport costs to the nearest port by railway and given assumed prices, regions, in which grain growing is not profitable, are not viewed as potential exporters;

Given the current grain export price, expanding grain cropland area is not profitable. This assumption is based on the fact that if cultivating these new areas was profitable with the current price, they would have attracted new businesses and investments. This brings up the conclusion that lands newly involved into cultivation are inferior in quality and location to the already cultivated ones and the cost per unit of production on such lands is higher. Also, cultivating new lands requires additional finance;

There is a correlation between the level of grain growing profitability and expanding grain cropland area: , where is the change of grain cropland area in region  $i$ , is profitability of growing grain;

Average yields per hectare, costs per unit of production and marketability of grain grown on newly introduced lands upon their cultivation will be the same as in the reporting period in each region.

#### 4.2.3. Maximum expansion of grain cropland area

Two ratios are used in the calculation of the maximum expansion of grain cropland area: the change of cropland area in a region ( $\Delta S_i = S_i^{1990} - S_i^{2010}$ ) and the share of grain in the total cropland area ( $DG_i$ ). This ratio is calculated for each region using the data for 1990 and 2010:

For each of the regions  $DG_i$  is selected as the maximum of two options of  $DG_i^{1990}$  and  $DG_i^{2010}$ . The maximum possible expansion of grain cropland area in RF regions is calculated using the formula:

Calculations are shown in Table 58. Let us illustrate the method with an example. In 2010 cropland area in the Belgorod region has reduced by 338 thousand ha with respect to 1990. If we assume that the entire area is in cultivation, i.e. the cropland area increases to 1,586 thousand ha, as in 1990, and that 49.2 % of that area may be under grain (the maximum grain share of 1990 and 2010). With such a share of grain, the expansion of cropland in newly cultivated areas may total to 166 thousand ha maximum (). The estimated expansion of grain cropland area will depend on grain prices and many other factors, but it cannot exceed the estimated maximum area. In the Leningrad region, cropland areas have reduced by 186 thousand ha. Should that area be brought back into circulation, grain areas may be expanded by 23 thousand ha, as the maximum specific share of grain in the region is only 12.6%.

#### 4.2.4. Costs of grain transport by railway to sea ports

The cost of transport is based on the following ports: Novorosiysk, Tuapse, Azov, St.Petersburg, and Vladivostok. It is calculated based on the distance from the railway terminal to the port (<http://tarif.riccom.ru/>) and the established average tariffs for transport per tonne of grain, which depend on the distance ([http://www.transfin-m.ru/about/infocenter/news\\_line/349](http://www.transfin-m.ru/about/infocenter/news_line/349)). For the purpose of this calculation the transport costs for each region are assumed to be the minimum value among the existing range of transport costs to various ports (see Annex 4, Yanbykh et al., 2013).

Table 58: Maximum possible expansion of grain cropland area

Region	Cropland, ths.ha			Grain cropland area, ths.ha			Share of grain in the cropland			Maximum grain area expansion ths.ha
	1990 $S_i^{1990}$	2010 $S_i^{2010}$	$\Delta S_i$	1990 $SG_i^{1990}$	2010 $SG_i^{2010}$	$\Delta S_i$	1990 $SG_i^{1990} / S_i^{1990}$	2010 $SG_i^{2010} / S_i^{2010}$	Max. value	
Belgorod Region	1,586	1,249	-338	718	614	-104	0.453	0.492	0.492	166
Bryansk Region	1,292	672	-620	622	315	-307	0.482	0.469	0.482	299
Vladimir Region	644	331	-312	293	84	-209	0.456	0.253	0.456	142
Voronezh Region	2,986	2,337	-649	1,518	1,086	-432	0.509	0.465	0.509	330
Ivanovo Region	609	219	-390	279	68	-211	0.458	0.308	0.458	179
Tver Region	1,475	633	-842	622	74	-548	0.422	0.117	0.422	355
Kaluga Region	919	302	-617	370	75	-295	0.403	0.248	0.403	248
Kostroma Region	662	207	-455	287	52	-235	0.433	0.251	0.433	197
Kursk Region	1,855	1,355	-500	966	895	-71	0.521	0.660	0.660	330
Lipetsk Region	1,513	1,214	-299	848	760	-88	0.561	0.625	0.625	187
Moscow Region	1,224	551	-673	286	85	-201	0.234	0.155	0.234	158
Oryol Region	1,568	1,077	-492	908	782	-126	0.579	0.726	0.726	357
Ryazan Region	1,687	771	-916	901	501	-400	0.534	0.650	0.650	596
Smolensk Region	1,439	456	-983	611	87	-524	0.425	0.191	0.425	417
Tambov Region	2,068	1,427	-642	1,165	818	-347	0.563	0.573	0.573	368
Tula Region	1,448	750	-699	818	515	-303	0.565	0.687	0.687	480
Yaroslavl Region	769	337	-432	316	48	-268	0.411	0.142	0.411	178
Arkhangelsk Region	295	104	-191	84	2	-82	0.286	0.021	0.286	55
Vologda Region	815	452	-363	288	134	-154	0.353	0.296	0.353	128
Kaliningrad Region	416	148	-268	184	64	-120	0.441	0.431	0.441	118
Leningrad Region	437	251	-186	37	32	-5	0.085	0.126	0.126	23
Murmansk Region	25	7	-18	0	0	-18	0.014	0.000	0.014	0
Novgorod Region	485	181	-303	151	12	-139	0.311	0.064	0.311	94

Region	Cropland, ths.ha			Grain cropland area, ths.ha			Share of grain in the cropland			Maximum grain area expansion ths.ha	
	1990 S <sub>1990</sub>	2010 S <sub>2010</sub>	ΔS <sub>i</sub>	1990 SG <sub>1990</sub>	2010 SG <sub>2010</sub>	1990 SG <sub>1990</sub> / S <sub>1990</sub>	2010 SG <sub>2010</sub> / S <sub>2010</sub>	1990 SG <sub>1990</sub> / S <sub>1990</sub>	2010 SG <sub>2010</sub> / S <sub>2010</sub>		Max. value
Pskov Region	875	276	-599	281	18	0.321	0.064	0.321	0.064	0.321	192
Karelia Republic	83	38	-44	0	0	0.005	0.003	0.005	0.003	0.005	0
Komi Republic	101	41	-60	1	0	0.006	0.000	0.006	0.000	0.006	0
Krasnodar Krai	3,903	3,634	-268	1,976	2,155	0.506	0.593	0.506	0.593	0.593	159
Astrakhan Region	324	76	-249	164	23	0.507	0.305	0.507	0.305	0.507	126
Volgograd Region	4,619	2,726	-1,893	2,670	1,619	0.578	0.594	0.578	0.594	0.594	1,124
Rostov Region	5,224	4,351	-873	2,941	2,823	0.563	0.649	0.563	0.649	0.649	566
Adygeya Republic	270	229	-41	120	114	0.444	0.499	0.444	0.499	0.499	20
Kalmykiya Republic	727	299	-428	403	217	0.555	0.725	0.555	0.725	0.725	310
Stavropol Krai	3,434	2,891	-543	1,792	2,139	0.522	0.740	0.522	0.740	0.740	402
Ingushetiya Republic	111	63	-48	0	39	0.000	0.624	0.000	0.624	0.624	30
Dagestan Republic	435	271	-164	221	104	0.507	0.383	0.507	0.383	0.507	83
Kabardino-Balkariya Republic	325	291	-34	152	176	0.467	0.603	0.467	0.603	0.603	21
North Osetiya-Alaniya Republic	206	161	-45	109	108	0.530	0.671	0.530	0.671	0.671	30
Karachayevsko-Cherkessiya Republic	192	122	-70	62	58	0.323	0.477	0.323	0.477	0.477	34
Chechen Republic	329	189	-140	0	102	0.000	0.537	0.000	0.537	0.537	75
Nizhny Novgorod Region	2,055	1,165	-890	1,071	563	0.521	0.483	0.521	0.483	0.521	464
Kirov Region	2,194	853	-1,341	1,186	327	0.541	0.383	0.541	0.383	0.541	725
Samara Region	2,679	1,834	-845	1,599	990	0.597	0.540	0.597	0.540	0.597	504
Orenburg Region	5,569	4,061	-1,508	3,754	2,808	0.674	0.691	0.674	0.691	0.691	1,042
Penza Region	2,230	1,169	-1,060	1,359	640	0.609	0.547	0.609	0.547	0.609	646
Perm Krai	1,850	795	-1,055	923	285	0.499	0.359	0.499	0.359	0.499	526
Saratov Region	5,564	3,605	-1,960	3,371	2,224	0.606	0.617	0.606	0.617	0.617	1,209

Region	Cropland, ths.ha			Grain cropland area, ths.ha			Share of grain in the cropland			Maximum grain area expansion ths.ha
	1990 $S_{1990}$	2010 $S_{2010}$	$\Delta S_t$	1990 $SG_{1990}$	2010 $SG_{2010}$	$\Delta S_t$	1990 $SG_{1990} / S_{1990}$	2010 $SG_{2010} / S_{2010}$	Max. value	
Ulyanovsk Region	1,644	950	-694	983	596	-387	0.598	0.627	0.627	435
Bashkortostan Republic	4,399	3,147	-1,252	2,594	1,761	-833	0.590	0.560	0.590	738
Mariy El Republic	603	300	-304	318	141	-177	0.527	0.470	0.527	160
Mordoviya Republic	1,137	726	-411	658	430	-228	0.579	0.593	0.593	243
Tatarstan Republic	3,402	2,928	-475	1,955	1,512	-443	0.575	0.517	0.575	273
Udmurtiya Republic	1,401	1,067	-334	739	416	-323	0.528	0.390	0.528	176
Chuvashiya Republic	800	572	-228	402	253	-149	0.502	0.443	0.502	115
Kurgan Region	2,640	1,374	-1,266	1,565	1,119	-446	0.593	0.815	0.815	1,032
Sverdlovsk Region	1,516	852	-664	710	350	-360	0.468	0.411	0.468	311
Tyumen Region	1,634	1,091	-543	903	708	-195	0.553	0.649	0.649	352
Chelyabinsk Region	2,694	2,074	-620	1,479	1,471	-8	0.549	0.709	0.709	440
Altay Krai	6,380	5,149	-1,231	3,998	3,394	-604	0.627	0.659	0.659	811
Krasnoyarsk Krai	2,879	1,461	-1,418	1,652	978	-674	0.574	0.669	0.669	949
Irkutsk Region	1,573	639	-934	727	358	-369	0.462	0.560	0.560	523
Kemerovo Region	1,447	1,037	-410	699	684	-15	0.483	0.659	0.659	270
Novosibirsk Region	3,443	2,326	-1,117	1,977	1,561	-416	0.574	0.671	0.671	749
Omsk Region	3,745	2,798	-947	2,055	1,894	-161	0.549	0.677	0.677	641
Tomsk Region	623	381	-242	288	240	-48	0.463	0.630	0.630	152
Zabaikalsk Krai	1,543	217	-1,326	932	152	-780	0.604	0.700	0.700	928
Altay Republic	147	103	-43	39	9	-30	0.266	0.089	0.266	12
Tuva Republic	282	28	-254	146	18	-128	0.519	0.651	0.651	166
Khakasiya Republic	598	223	-375	312	91	-221	0.521	0.408	0.521	195
Primorsk Krai	742	314	-428	229	80	-149	0.309	0.255	0.309	132
Khabarovsk Krai	121	73	-49	18	6	-12	0.148	0.084	0.148	7

Region	Cropland, ths.ha			Grain cropland area, ths.ha			Share of grain in the cropland			Maximum grain area expansion ths.ha
	1990 $S_{1990}$	2010 $S_{2010}$	$\Delta S_t$	1990 $SG_{1990}$	2010 $SG_{2010}$		1990 $SG_{1990} / S_{1990}$	2010 $SG_{2010} / S_{2010}$	Max. value	
Amursk Region	1,623	790	-833	637	204		0.393	0.258	0.393	327
Kamchatka Kray	65	22	-43	0	0		0.000	0.014	0.014	1
Sakha (Yakutiya) Republic	107	44	-63	24	15		0.224	0.347	0.347	22
Jewish Autonomous Area	147	108	-38	44	15		0.300	0.135	0.300	12
Buryatiya Republic	767.8	192.8	-575	357	107		0.465	0.555	0.555	319
Russian Federation	117,619	75,157	-42,462	62,869	43,194		x	x	0.570	24,188

Source: author's calculations

#### 4.2.5. Grain cropland area expansion and grain sales profitability

The main hypothesis is to reflect the possibility of grain cropland area expansion depending on the grain sales profitability. In other words, an increase in grain sales profitability leads to expanding cropland areas under grain.

##### Methodology

The model is built using data of a comparable group of agricultural enterprises for 2004-2007<sup>60</sup>. We select from the

database the economic ratios related to grain sales for each agricultural enterprise (sales volume, sales revenue, cost of grain sold) and the grain cropland area.

Using the ratios, we have calculated the average grain sales profitability and cropland area for three years (from 2004 to 2006). All agricultural enterprises are then grouped by their profitability as follows: over 100%; 80/90%; 70/80%; 60/70%; 50/60%; 40/50%; 30/40%; 20/30%; 10/20%; 0/10%; -10/0%; -20/-30%; -30/-40%; below -40%. For each of these groups we have finally calculated average grain cropland areas for 2004 to 2007.

<b>Table 59: Agricultural operators grouped by grain sales profitability, 2004-2006</b>					
<b>Groups by profitability</b>	<b>Number of operators</b>	<b>Average profitability</b>	<b>Average land area, ha</b>	<b>Land area, 2007, ha</b>	<b>Land area change, %</b>
(1)	(2)	(3)	(4)	(5)	(6) = [(5) / (4)] - 1
above 100%	211	144.9	519,738	550,280	5.9
80-90%	102	95.3	228,142	242,806	6.4
70-80%	124	84.8	312,897	328,390	5.0
60-70%	173	74.4	534,614	556,486	4.1
50-60%	268	65.0	678,802	701,140	3.3
40-50%	419	54.7	1,134,427	1,209,502	6.6
30-40%	558	44.7	1,478,679	1,481,784	0.2
20-30%	785	34.6	2,222,286	2,179,298	-1.9
10-20%	1,057	24.8	2,740,173	2,761,954	0.8
0-10%	1,181	15.0	2,785,512	2,695,769	-3.2
-10 -0%	1,136	5.2	2,547,950	2,459,668	-3.5
-20 -10%	908	-4.6	1,460,306	1,344,424	-7.9
-30 -20%	655	-14.7	898,320	772,437	-14.0
-30 -40%	455	-24.8	534,306	440,184	-17.6
below 40%	704	-45.9	459,297	345,091	-24.9

Source: author's calculations based on Rosstat data

<sup>60</sup> The sample group includes agricultural enterprises, which were operational during those years

## Results

The comparative analysis of data obtained from the grouping by grain sales profitability displays:

- A stable growth of grain cropland area demonstrated by the group of agricultural enterprises having a profitability of over 40% for three years;
- Fluctuating values of change of grain cropland area, demonstrated by the group of agricultural enterprises having a profitability between 0 and 40%;
- A stable reduction of grain cropland area for agricultural enterprises whose grain sales are unprofitable.

Based on the group data we calculated a regression equation, describing the dependence of the growth of arable land on grain sales profitability. We tested three functions for the description of the correlation: linear, logarithmic and cuspidal. The most suitable specification is the logarithmic function. Statistical characteristics of the linear function are significantly worse than those of the logarithmic specification. Determination coefficient ( $R^2$ ) equalled 0.767 in a linear model and 0.903 in a logarithmic one, the standard error (Std.Err. of Estimate), characterizing the variance between the actual and the estimated land area growth values were

4.782 and 3.077 accordingly (see Annex 5, Yanbykh et al., 2013). Furthermore, the quadratic function by its statistical characteristics is better than the logarithmic one ( $R^2=0.960$ , the equation standard error – 2.052). However a quadratic function has a point of extremum. In this case such point is reached at grain sales profitability of 103%. By our estimates such profitability has been achieved at the grain export price of \$280 per tonne. If the price goes higher the land area under grain estimated by the quadratic function starts to reduce, which contradicts common sense (see Annex 5, Yanbykh et al., 2013). To avoid some calculations of the logarithm of the profitability, we have decided to increase all profitability values by a constant (50) which changed all the X values from negative to positive ones. This has been done previously in the literature and arguably does not impact on the main findings of the analysis. The calculation of ratios and parameters of the model shows a high degree of correlation between the factors. The regression equation looked as follows:

$$Y = -42.82 + 9.56 \cdot \ln(X+50)$$

Where: Y is the change of grain cropland area (%) and X the level of sales profitability in the group (%). The statistic validity of the relation is confirmed by a high Fisher's stability factor ( $F(1,13) = 121,7$ ), as well as the t of the Student's test ( $t = 3,08$ ).

**Table 60: Regression analysis results**

	Coefficients	t-statistics	P-value
Constant	-42.82 (3.720)	-11.51	0.000
Ln(X +50)	9.56 (0.866)	11.03	0.000

$R = 0.951$  ;  $R^2 = 0.903$

### 4.2.6. Grain production and export volumes for a grain export price of \$200

For each value of the export price, in each region we have calculated the increase in area if the profitability of grain growing (including transport costs) exceeds 40%. If the profitability in a region is below 40%, the increase is not calculated. The volume of potential additional grain export has thus been determined on the basis of area growth. An example of calculation for export price \$200 is shown in Table 61.



Table 61: Areas, gross yields and grain export volumes

Regions	Profitability, % Actual, 2008- 2010	At \$200 price	Area increment % calculation	Area increment, ha	Yield, 2008- 2010, hwt/ha	Increment of gross grain yield, tonne	Marketability, %	Increment of exported volume, tonne
Belgorod Region	3.6	32.1			27.8		99.3	
Bryansk Region	7.2	54.7	1.6	5	15.7	8	64.1	5
Vladimir Region	12.3	12.4			18.2		29.8	
Voronezh Region	6.8	55.4	1.7	19	19.9	37	93.1	34
Ivanovo Region	6.9				15.7		39.5	
Tver Region	-7.2				12.4		31.2	
Kaluga Region	13.7				22.4		31.9	
Kostroma Region	-12.4				12.8		26.5	
Kursk Region	14.8	55.4	1.7	15	25.6	39	93.0	36
Lipetsk Region	12.5	53.3	1.5	12	25.9	30	87.5	26
Moscow Region	-0.2	13.2			24.0		55.9	
Oryol Region	9.0	50.0	1.2	9	24.9	23	87.3	21
Ryazan Region	25.4	55.2	1.7	8	22.2	19	79.3	15
Smolensk Region	3.0	10.7			14.5		25.4	
Tambov Region	7.6	63.0	2.4	19	21.8	42	92.1	39
Tula Region	16.6	46.0	0.8	4	22.7	9	76.0	7
Yaroslavl Region	5.0	2.3			16.1		18.8	
Arkhangelsk Region	20.8	-42.5			14.8		17.1	
Vologda Region	2.9	2.0			14.7		20.7	
Kaliningrad Region	14.2	18.9			35.4		78.0	
Leningrad Region	-2.0	-10.8			29.3		18.2	
Murmansk Region							0.0	
Novgorod Region	-15.2	-20.8			13.5		24.3	

Regions	Profitability, % Actual, 2008- 2010	At \$200 price	Area increment % calculation	Area increment, ha	Yield, 2008- 2010, hwt/ha	Increment of gross grain yield, tonne	Marketability, %	Increment of exported volume, tonne
Pskov Region	-6.1	-20.1			16.4		29.5	
Karelia Republic	24.6	-13.7			29.0		22.3	
Komi Republic							90.0	
Krasnodar Kray	37.5	58.8	2.0	43	45.1	196	80.7	158
Astrakhan Region	10.2	-28.3			19.9		67.8	
Volgograd Region	15.8	61.3	2.2	36	14.9	54	87.2	47
Rostov Region	19.9	68.5	2.8	80	23.4	187	78.3	147
Adygeya Republic	23.1	88.8	4.3	5	39.8	20	66.3	13
Kalmykiya Republic	24.2	66.2	2.6	6	15.6	9	71.4	6
Stavropol Kray	25.0	71.0	3.0	65	32.3	209	85.3	178
Ingushetiya Republic	-16.4	9.2			14.5		60.1	
Dagestan Republic	0.5	15.1			20.1		19.9	
Kabardino-Balkariya Republic	16.5	44.8	0.7	1	34.9	4	75.7	3
North Osetiya-Alaniya Republic	5.7	38.2			39.8		56.1	
Karachayevo- Cherkessiya Republic	-11.5	31.9			26.1		72.3	
Chechen Republic	-26.5	-10.2			14.7		72.2	
Nizhny Novgorod Region	4.9	22.4			17.5		62.0	
Kirov Region	17.0	30.1			17.8		38.6	
Samara Region	17.0	42.7	0.5	5	8.2	4	80.5	3
Orenburg Region	21.6	25.2			5.7		91.3	
Penza Region	5.4	42.8	0.5	3	14.6	5	78.7	4
Perm Kray	10.0	3.9			13.7		30.6	

Regions	Profitability, % Actual, 2008- 2010	At \$200 price	Area increment % calculation	Area increment, ha	Yield, 2008- 2010, hwt/ha	Increment of gross grain yield, tonne	Marketability, %	Increment of exported volume, tonne
Saratov Region	11.4	47.8	1.0	22	8.6	19	65.6	12
Ulyanovsk Region	11.7	35.1			11.9		86.1	
Bashkortostan Republic	7.7	20.3			10.5		48.8	
Mariy El Republic	11.0	21.7			13.5		42.5	
Mordoviya Republic	11.3	33.1			18.6		70.7	
Tatarstan Republic	1.9	21.9			16.9		54.3	
Udmurtiya Republic	10.4	16.0			11.6		22.6	
Chuvashiya Republic	9.5	24.0			13.8		45.4	
Kurgan Region	18.1	17.4			11.3		69.0	
Sverdlovsk Region	4.3	-0.8			17.5		26.2	
Tyumen Region	-2.2	9.8			19.5		48.7	
Chelyabinsk Region	14.6	7.2			7.3		50.4	
Altay Kray	32.5	36.6			14.5		54.0	
Krasnoyarsk Kray	25.9	32.0			22.8		59.6	
Irkutsk Region	16.5	6.7			17.3		38.3	
Kemerovo Region	23.3	36.7			20.1		57.1	
Novosibirsk Region	28.1	44.0	0.6	10	17.8	17	53.6	9
Omsk Region	12.5	30.7			16.5		59.1	
Tomsk Region	4.1	6.1			15.7		64.3	
Zabaikalsk Kray	16.2	29.9			13.4		67.8	
Buryatiya Republic	28.4	14.2			7.1		46.7	
Altay Republic	37.7	42.6	0.5	0	14.5		20.5	
Tuva Republic	-20.8	-35.0			8.6		27.8	

Regions	Profitability, % Actual, 2008- 2010	At \$200 price	Area increment % calculation	Area increment, ha	Yield, 2008- 2010, hwt/ha	Increment of gross grain yield, tonne	Marketability, %	Increment of exported volume, tonne
Khakasiya Republic	6.0	-5.5			13.2		41.0	
Primorsk Kray	4.9	-15.6			21.0		52.9	
Khabarovsk Kray	-4.3	-31.8			18.5		21.0	
Amursk Region	-2.3	1.9			11.5		67.8	
Kamchatka Kray					7.5		96.6	
Sakha (Yakutiya) Republic	-49.7	-63.8			5.9		57.5	
Jewish Autonomous Area	4.4	-12.1			11.0		28.4	
Total, Russia	17.6				18.3	673	66.7	764

Source: author's calculations based on Rosstat data

#### 4.2.7. Area changes and grain export volumes under different export price scenarios

We also simulate several options of grain export price at a sea port (per tonne): \$220, \$240, \$260, \$280, \$300, \$320, \$340, \$360, \$380, \$400. Similar calculations for other export price variants are given in Yanbykh et al. (2013)<sup>61</sup>.

Aggregate results across multiple scenarios of export price are presented in Table 62. When the increase in grain area is above the (previously) calculated resource potential, the volume of production is calculated on the base of the maximum cultivable land area in the region and after that remains constant.

**Table 62: Russian grain export volumes under different export price scenarios/time horizons**

Export price (\$ per tonne)	Increase After 1 year			Increase After 5 years**			Increase After 10 years**		
	Area, ths.ha	% of max. possible*	Grain export, ths. tonne	Area, ths.ha	% of max. possible*	Grain export, ths. tonne	Area, ths.ha	% of maximum possible*	Grain export, ths. tonne
200	368	1.5	764	1,777	7.3	3,599	2,896	12.0	5,463
220	803	3.3	1,443	3,705	15.3	6,200	6,182	25.6	9,444
240	1,320	5.5	2,143	5,850	24.2	8,525	9,826	40.6	13,105
260	1,831	7.6	2,795	7,989	33.0	10,692	12,834	53.1	15,701
280	2,300	9.5	3,383	9,748	40.3	12,418	14,861	61.4	17,370
300	2,719	11.2	3,902	11,179	46.2	13,785	16,074	66.5	18,456
320	3,086	12.8	4,323	12,392	51.2	14,863	16,962	70.1	19,325
340	3,421	14.1	4,709	13,401	55.4	15,719	17,703	73.2	20,050
360	3,731	15.4	5,065	14,191	58.7	16,389	18,335	75.8	20,666
380	4,018	16.6	5,397	14,806	61.2	16,929	18,863	78.0	21,155
400	4,285	17.7	5,706	15,327	63.4	17,404	19,254	79.6	21,482

Source: Author's calculations. Notes: \* The potentially cultivable area is calculated in Table 58.

\*\* The scenario assumes that the export price remains the same along the period.

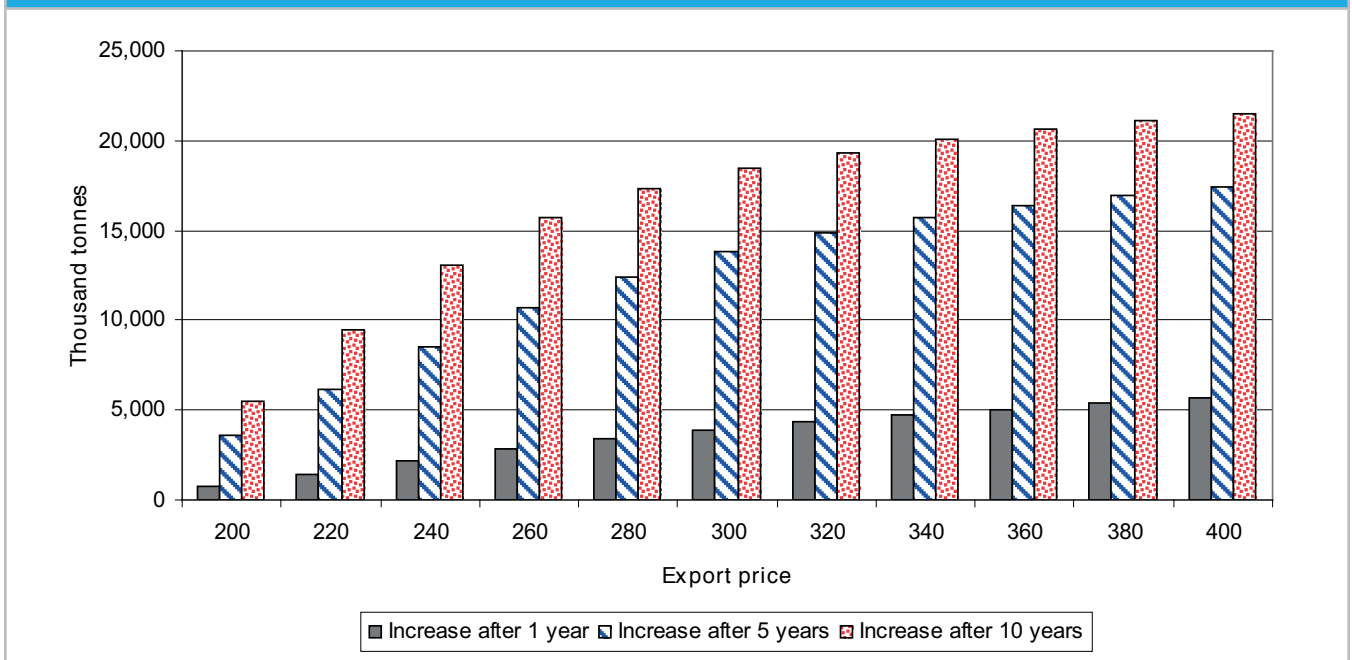
61 Available in Annex 3.

Figure 18 below shows how the volume of grain exports would increase for different grain export prices (at port). Figure 19 maps the results across the republics of Russia. These results confirm that grain export would increase, via the expansion of land areas under grain, at an average annual price of \$200 per tonne. If the latter remained stable for 5 years, the additional grain exports volume would amount to 3.6 million tonnes and over 10 years – 5.5 million tonnes (approximately 20% of the current level of exports). With more significant rises of global grain prices, the incentive to export will grow, but there will be a gradual slowing down of growth rates, as less and less fertile lands will be involved into cultivation. As you can see, even at the unlikely price

of \$400 per tonne for the next 10 years it would only be possible to bring back into cultivation less than 80% of all potentially cultivable land<sup>62</sup>.

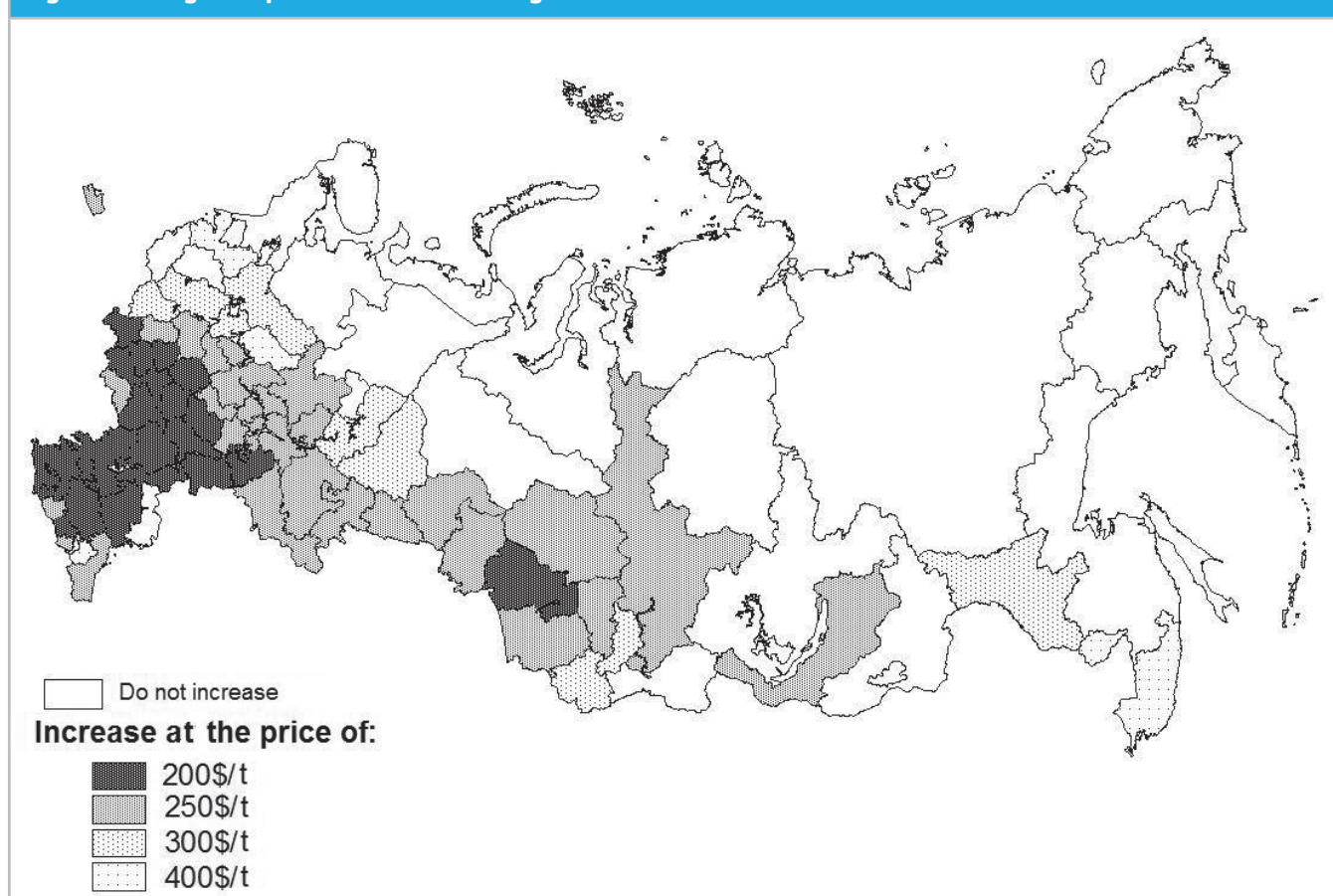
In view of the evidence, there exists an option of increasing Russian grain export by cultivating abandoned agricultural land. However, given the current grain market situation and the costs such option might involve, this would seem hardly conceivable and economically feasible for Russia, unless market conditions drastically changed. Instead, we now study whether Russia has a better potential for grain production growth through yield increases and the application of modern technologies on land currently used for grain growing.

**Figure 18: Results of additional export volume of grain under different export price scenarios**



<sup>62</sup> Similar calculations are carried in the cuspidal model. Results are presented in Yanbykh et al. (2013), Annex 5 .

Figure 19: Regional potential of Increasing Grain Production in Russia



### 4.3 Infrastructures and logistic capacity

Since 2001 Russia has been one of the world's largest grain exporters to the world market, especially of Class 4 food wheat and forage wheat<sup>63</sup>. In the world market Class 4 wheat belongs to the same segment as French milling wheat and American soft wheat, though it has higher protein contents, which is one of its quality characteristics. Over the period 2002/2003 that saw record high harvests for post-soviet times in Russia and low harvests in the main exporting countries, Russia exported 18.5 million tons of grain and milled grain, which was unprecedented in the country's history.

Since the transition to a market economy, Russia progressively offered more competitive prices due to lower costs (e.g. fuel, plant protection, labour and land lease). Russia has significantly enhanced its presence in the markets of North and Central Africa (mainly Egypt), Commonwealth of Independent States (i.e. former Soviet countries, e.g. South Caucasus), and has developed its exports to South-Eastern Asia (e.g. India, Pakistan, Bangladesh, Indonesia). Meanwhile,

the market share traditionally dedicated to South European countries has reduced since the seasons of 2001/2002 and 2002/2003, characterised by extremely high yields in Russia and a drop in gross yields in the EU.

In 2008/2009 Russia broke another record and exported over 23 million tons of grain (including milled grain). In the same period apart from its leading export positions in wheat and barley, Russia exported a peak amount of corn, i.e. 1 million ton and shared the 6<sup>th</sup> place among global corn exporters with Serbia and Paraguay. However, despite such evolutions, Russia faces strong infrastructure limitations, both internally and externally. Indeed Russia's Logistic Performance Index (LPI)<sup>64</sup> is very low (in 95<sup>th</sup> position out of 155 countries), indicating that the country has generally poor infrastructures. In other words, Russia experiences a serious mismatch between the country's grain export potential and existing and available storage (i.e. elevator), port and transport infrastructures.

#### 4.3.1 Storage capacities

According to official data Russia's overall grain storage capacity is about 118.3 million tons. This figure includes 95 million tons of specialised grain elevator capacities

63 The latter is traditionally added to export batches of Class 4 food wheat.

64 See <http://lpi.survey.worldbank.org>.

(i.e. elevator and warehouse storage), including mill grain elevators, with the rest being storage facilities located within agricultural enterprises. Linear elevators account for about 50 million tons, about 1.9 million tons can be attributed to port elevators and the rest to mill elevators (66.4). The 2008/09 season is a good example of the country's infrastructural mismatch. During this season of record high yields, the shortage of storage capacities was approximately 18 million tons<sup>65</sup>.

The pattern is also regionally heterogeneous as the most significant shortage was recorded in the Southern, Central and the Volga Federal Districts. In 2009 a similar situation was recorded in the Siberia District, where the gross yield was about 17.5 million tons with available storage capacities of 14.4 million tons. In turn, this mismatch has caused price increases for elevator services before the harvest of 2009.

Also, most existing grain elevators are technologically outdated and incapable of rendering quality services of further handling, storage and transshipment of grain. There are only several dozens of elevators that can arrange full train shipments. In most cases grain is stored in elevators for a limited time after harvesting. The majority of elevator capacities (i.e. mill, linear and port grain elevators) are located in the Volga District (~27%), due to the leading role of the area in grain production during the Soviet era; the Southern District has the second largest share and the third place is shared between the Central and the Siberian Districts. Most of the linear grain elevators are located in the Southern District, most of the mill grain elevators are in the Siberia District. As for capacities of linear grain elevators it should be noted that, out of 52 million tons, almost 52% (or 26.9 million tons) are vertical storage facilities: in the Southern District such storage facilities amount to 57%, in the Volga District 57%, and in the Central District 46.5%.

### 4.3.2 Transshipment capacities

As of today, the transshipment capacity of existing ports in Russia is approximately 28 million tons a year. The ports of Novorossiysk, Tuapse and Tamanj, which are the main destinations of railway carriage handle about 65 per cent of exports, with 13 million tons handled solely by Novorossiysk (i.e. Tuapse – 2.5 and Tamanj – 2.5, for a total of 18 million tons). About 10 million tons, i.e. 35 per cent of Russia's total exports are carried out via relatively smaller (shallow) ports, designed for ships with an intake capacity of under 5,000 tons and are located on the Azov (Azovsk, Eysk, Taganrog, Rostov-on-Don) and Baltic (Saint Petersburg, Kaliningrad) seas and on the Pacific Ocean (Vladivostok, Nakhodka). For such ports, the majority of deliveries to these ports are made by motor vehicles due to shorter distances and significantly smaller amounts compared to the ports of Novorossiysk and Tuapse. Overall, there is a shortage of transshipment

capacities; for example, in 2008/2009 record yields increased the total export potential of Russia to 32 million tons, while the maximum grain haulage capacities of ports, almost fully utilised, amounted to 22.4 million tons, which resulted in a shortage of grain export capacities of about 9 million tons. However, let's note that the situation has recently improved since the transshipment capacity has increased by about 25 per cent between then and now.

In addition, the share of railway carriage in the total volume of export from Russia amounts to 43%, i.e. 9.7 million tons. Motor vehicles transport around 11.9 million tons (53%) and 0.8 million tons (4%) is transported through rivers and canals. The sector of export carriage is significantly consolidated, i.e. over 60 per cent of carriage is done by fifteen large exporters. Major export shipments concentrate in North-Caucasus railways as 80 per cent of export shipments go through its stations. The main points of destination for export carriage are Novorossiysk – 67%, Samur – 15% and Tuapse – 8%. Together these stations account for 90 per cent in the total export carriage volume. It is forecasted that by 2020 the volume of export carriage will reach 17 million tons. It is important to keep in mind that the right to export grain from Russia belongs to a few major domestic agro-industrial companies, foreign trade companies or other companies which may or may not be directly related to grain growing. While some Russian companies export grain grown by their own production units via their trade divisions (e.g. LLC Trading House "Razgulay Zerno", LLC Trading House "OGO-Produkty"), the others export production purchased from agricultural producers (LLC "Krasnodarzernoprodukt") or export grain from national stocks (OLSC "Agency for food market regulation"). Foreign companies buy grain from agricultural enterprises or traders and export either via a subsidiary or as a foreign company. In the first six months of 2009, 75 per cent of grain, which passed through the port terminals of Novorossiysk were exported by foreign companies. All major Russian and foreign exporters have their own grain storage facilities. Typically they are large linear grain elevators where grain is accumulated for ship carriage. During the harvest season exporters often have grain delivered from the threshing floor straight to the port (omitting the elevator). All major changes in the patterns of export would naturally go through those most important actors.

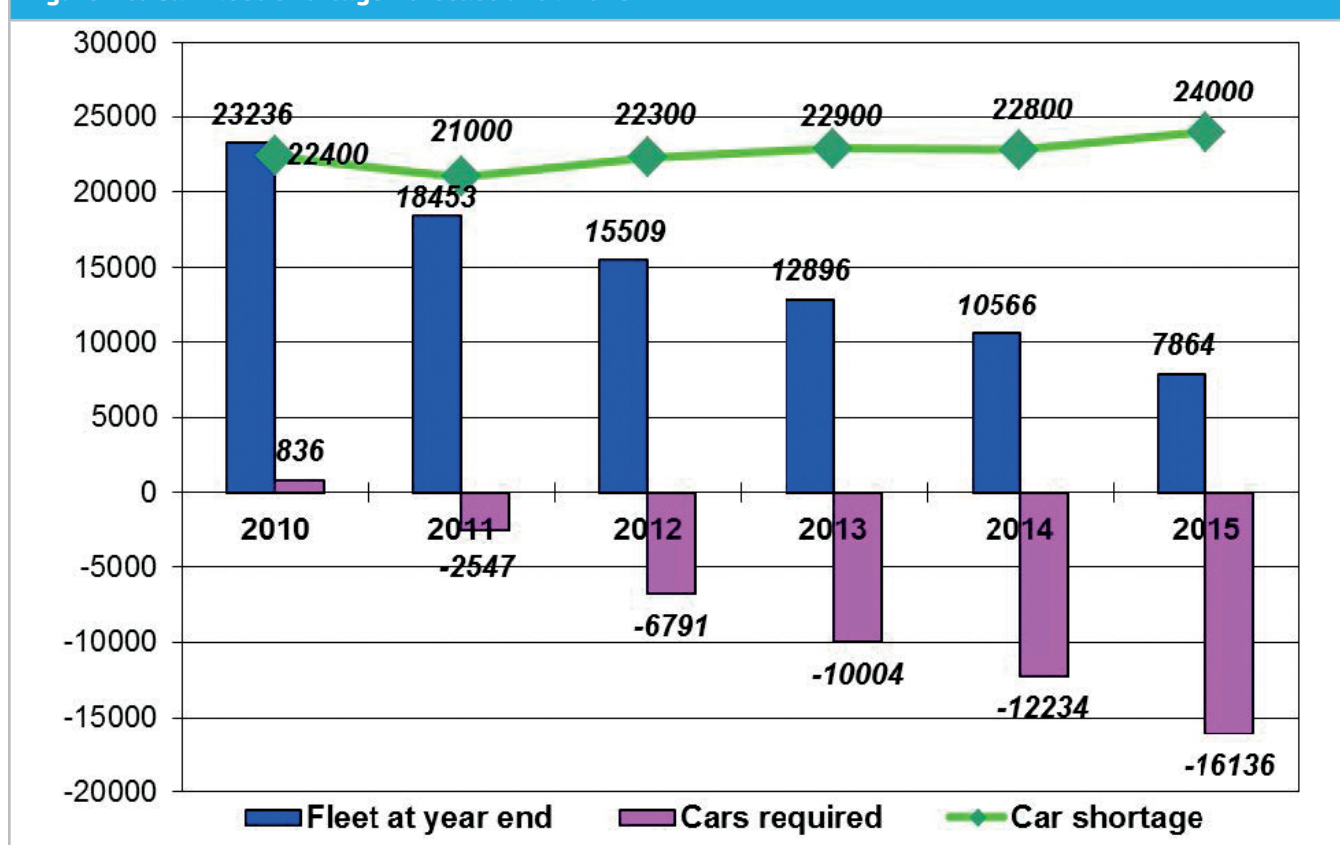
### 4.3.3 Inland carriage

Inland carriage is extremely diverse as to consignors and consignees. The main grain customers are mills and animal feed compound producers. Most shipments (55% of the total volume) are going via Moscow, Oktyabrskaya, Gorkovskaya and Northern railways, 45% is divided between the remaining 13 railways. Inland carriage volume will, most likely, demonstrate slow growth: from 13 million tons to 17 million tons. Transit volume (mainly wheat exported from Kazakhstan) will reach about 4.6 million tons.

<sup>65</sup> This does not take into account the gross yield of oil crops in the same season, which was evaluated at about 9 million tons.



Figure 20: Car Fleet Shortage Forecast until 2015



Source: [www.rusagrotrans.ru](http://www.rusagrotrans.ru)

Railway grain-carrying cars are on average slightly older than 24 years, while their established service life is 30 years. The analysis of the railway grain-carrying cars fleet shows that by 2015 the majority of them (77%) should be retired. In view of the expected growth of volumes that need to be transported, mass retirement of railway cars and the inefficient use of the remaining car fleet, it is forecasted that by 2015 the shortage of grain cars may reach about 16,000 cars.

#### 4.3.4 The current situation

Russia experiences a serious mismatch between its grain production potential and its export potential. The latter is structurally restricted by the lack of storage, transshipment and carriage capacities which limit the potential of Russia to export the excess production. Given gross grain yield forecasts for 2020 (~133/136 million tons) and the expected growth of oil crop yields, the existing shortage of storage capacity is unlikely to be eliminated without the implementation of numerous investments. In the mid-term perspective the export potential will be determined by the evolution of global prices and the state of export infrastructure. Finally, export has gained significance but also affects prices within the country, which could lead domestic authorities to take restricting measures until new infrastructures are built.

However, it is noteworthy that there have been improvements. Another step further towards the modernisation of grain

market infrastructure has been made last year within the Target Program of the Ministry of Agriculture, through the "Development of infrastructure and logistics of agro-food market, expanding storage and sales capacities of agricultural products, using, inter alia, the potential of OJSC "United Grain Company". Under this program, OJSC "United Grain Company" has implemented the following investment projects:

- Increased grain transshipment capacity to sea vessels from 350 to 450,000 a month due to modernisation of production facilities at OJSC "Novorossiysky Bakery Plant" restored grain storage capacity of 38,000 tons in total;
- Performed preparatory works and started assembly of grain warehouses with the total simultaneous storage capacity of 12,000 tons.

In addition, in 2012, as part of the grain infrastructure development program activities, the Ministry of Agriculture approved 54 investment projects for the construction and modernisation of the existing grain storage and handling capacities. Credits extended to agricultural enterprises, including smaller businesses, have amounted to 5.61 billion rubles. In 2012 the Federal budget subsidies for the same purpose has amounted to 201.1 million rubles. The simultaneous grain storage capacity has been increased by 644,900 tons.

#### 4.4. Crop yield and productivity growth

This section estimates the capacity to expand production for a few basic product classes, based on crop yields and livestock rearing productivity. Estimates are based on the agricultural plant crop yields and livestock rearing productivity according to the trends from 1990 to 2011. They are also compared on crop yields and productivity growth in the Russian Federation regions against the levels of developed economies with similar bioclimatic potentials. The potential to increase yields is estimated by crops: grain and pulse crops, beets, sunflower, sugar beet, field vegetables, fruit and berries. Time series of basic agricultural crops are presented in Table 63. A brief analysis allows distinguishing the following patterns, regarding all crops:

- Yearly sharp oscillation of crop yield. This is evidenced by high crop yield variability rates;  $V=\sigma/\alpha*100$ , where:  $V$  variability rate,  $\sigma$  mean square deviation,  $\alpha$  arithmetic mean);
- Yield decrease during the first years of the reform (1990-1998) and its growth in the following years.

Yields of all agricultural crops have grown. In 2011 the yield of fruit and berries has been 1.8 times higher, sugar beet – 1.6 times higher, soy beans, potato and vegetables – 1.3-1.4 times higher and grain – 1.2 times higher than in 1990.

**Table 63: Agricultural crop yields (hwt per ha of the harvested area, all agricultural operators)**

Years	Grain and pulse crops	Sugar beet	Sunflower	Soy beans	Potatoes	Field vegetables	Fruit and berry plantations
1990	19.5	240.1	13.7	11.1	104.2	166.6	27.5
1991	15.1	178.1	11.8	10.1	109.0	155.8	25.3
1992	18.0	192.2	11.6	8.5	113.7	145.1	32.3
1993	17.1	198.6	10.0	9.2	108.6	141.4	30.6
1994	15.3	135.6	8.4	8.6	102.5	133.8	22.6
1995	13.1	188.3	10.6	7.5	117.7	147.8	23.5
1996	14.9	173.7	8.1	7.2	114.4	145.2	33.1
1997	17.8	186.2	8.6	8.8	111.4	147.4	30.4
1998	12.9	152.7	8.4	7.8	97.1	140.9	26.2
1999	14.4	185.0	8.3	8.3	96.5	146.6	23.8
2000	15.6	188.3	9.0	10.1	104.7	143.3	35.1
2001	19.4	198.9	7.8	9.4	108.4	150.9	32.1
2002	19.6	219.2	9.7	11.7	102.8	148.2	37.9
2003	17.8	227.2	10.0	9.8	116.7	163.0	36.5
2004	18.8	276.5	10.2	10.0	116.0	161.6	40.2
2005	18.5	282.3	11.9	10.5	123.8	170.0	40.2
2006	18.9	325.4	11.4	9.9	133.3	172.6	35.2
2007	19.8	292.0	11.3	9.2	132.0	178.8	46.5
2008	23.8	362.4	12.3	10.5	137.5	196.2	45.0
2009	22.7	323.2	11.5	11.9	142.7	199.2	52.4
2010	18.3	240.7	9.6	11.8	100.2	180.3	41.5
2011	22.4	384.8	13.4	14.8	148.3	208.2	49.6
Variability rate	16.4	29.4	16.8	17.6	12.9	12.9	24.7

Source: author's calculations based on Rosstat data.

According to the observed patterns, crop yield forecasts are based on three-year moving averages of crop yield levels. They were estimated as weighted values, taking into account the harvested areas and croppage of the respective years (Table 64). To approximate crop yield series, equations providing the highest determination coefficient (R<sup>2</sup>) and Fisher's ratio test (F) are chosen. For the majority of agricultural crops the highest values are obtained using the following type of equation:

$$y = \exp(a_0 + a_1 t)$$

Where *y* is an average moving three-year crop yield, *t* is year, *a*<sub>0</sub>, *a*<sub>1</sub> (*a*<sub>2</sub>, *a*<sub>3</sub>) are equation coefficients. The most suitable

equation type for grain crops and sugar beet appear to be of quadratic form:

$$y = a_0 + a_1 t + a_2 t^2$$

And for soy beans:

$$y = a_0 + a_1 t + a_2 t^2 + a_3 t^3$$

Regression coefficients obtained as a result of crop yield trend lines approximation of all reviewed crops are statistically adequate as indicated by the values of Fisher's F test (Table 65). The equations explain the majority of crop yield variations by year, as indicated by the high values of the determination coefficient: R<sup>2</sup> changes from 0.824 for soy beans to 0.985 for field vegetables. All calculated regression coefficients are statistically significant.

**Table 64: Moving Average agricultural crop yields in the Russian Federation, in hwt/ha**

Years	Grain and pulse crops	Sugar beet	Sunflower	Soy beans	Potatoes	Field vegetables	Fruit an berry plantations
1990-1992	17.5	203.5	12.4	9.9	109.0	155.8	28.3
1991-1993	16.7	189.6	11.1	9.3	110.4	147.4	29.4
1992-1994	16.8	175.5	10.0	8.8	108.3	140.1	28.5
1993-1995	15.2	174.2	9.7	8.4	109.6	141.0	25.6
1994-1996	14.4	165.9	9.0	7.8	111.5	142.3	26.4
1995-1997	15.3	182.7	9.1	7.8	114.5	146.8	29.0
1996-1998	15.2	170.9	8.4	7.9	107.6	144.5	29.9
1997-1999	15.0	174.6	8.4	8.3	101.7	145.0	26.8
1998-2000	14.3	175.3	8.6	8.7	99.4	143.6	28.4
1999-2001	16.5	190.7	8.4	9.3	103.2	146.9	30.3
2000-2002	18.2	202.1	8.8	10.4	105.3	147.4	35.0
2001-2003	18.9	215.1	9.2	10.3	109.3	154.0	35.5
2002-2004	18.7	241.0	10.0	10.5	111.8	157.6	38.2
2003-2005	18.4	262.0	10.7	10.1	118.8	164.9	39.0
2004-2006	18.7	294.7	11.2	10.1	124.4	168.1	38.5
2005-2007	19.1	299.9	11.5	9.9	129.7	173.8	40.6
2006-2008	20.8	326.6	11.7	9.9	134.3	182.5	42.2
2007-2009	22.1	325.9	11.7	10.5	137.4	191.4	48.0
2008-2010	21.6	308.8	11.1	11.4	126.8	191.9	46.3
2009-2011	21.1	316.2	11.5	12.8	130.4	195.9	47.8
Variabilityrate	13.8	26.3	13.2	13.3	9.9	11.7	21.5

Source: author's calculations

**Table 65: Regression results for several crops, 1998-2011**

	Equation	R <sup>2</sup>	F	Std.Err (intercept)	p-level (intercept)
Grain and pulse crops	$y=19.08-4.78/t+0.022t^2$	0.905	42.946	0.610	0.000
Sugar beet	$y=245.9-85.014/t+0.725t^2$	0.866	29.015	18.399	0.000
Sunflower	$y=\exp(2.1151+0.0371t)$	0.841	53.024	0.033	0.000
Soy beans	$y=14.55-1.124t-5.003/t+0.08t^2$	0.824	12.473	1.678	0.000
Potatoes	$y=\exp(4.589+0.029t)$	0.872	67.824	0.026	0.000
Field vegetables	$y=\exp(4.92+0.0308t)$	0.985	666.07	0.009	0.000
Fruit and berry plantations	$y=\exp(3.364+0.045t)$	0.934	141.07	0.028	0.000

Source: author's calculations

Using predicting equations, crop yield forecasts until 2020 are presented in Table 66, and diagrams of the average moving three-year crop yield and forecasts regarding certain crops are displayed in Figures 21-27.

**Table 66: Crop yield forecasts, hwt/ha**

Years	Grain and pulse crops	Sugar beet	Sunflower	Soy beans	Potatoes	Field vegetables	Fruit and berry plantations
2010-2012	22.4	361.9	12.7	13.2	142.9	204.3	51.7
2011-2013	23.1	382.0	13.2	14.3	147.1	210.7	54.1
2012-2014	23.7	403.4	13.6	15.6	151.4	217.2	56.6
2013-2015	24.4	426.2	14.1	17.0	155.8	224.0	59.2
2014-2016	25.2	450.5	14.6	18.5	160.3	231.0	61.9
2015-2017	26.0	476.1	15.0	20.3	165.0	238.3	64.7
2016-2018	26.8	503.2	15.5	22.1	169.8	245.7	67.7
2017-2019	27.7	531.7	16.1	24.2	174.7	253.4	70.8
2018-2020	28.6	561.7	16.6	26.4	179.8	261.3	74.0

Source: author's calculations

Crop yields are expected to increase by factors of 1.3-1.6 for all crops by 2018-2020 compared to 2009-2011. Forecast yields of 1) grain is 7.5 hwt/ha (35.5%) higher, 2) sunflower is 5.1 hwt/ha (44.3%) higher, 3) potato is 49.4 hwt/ha (37.9%) higher, 4) vegetables is 65.4 hwt/ha (33.4%) higher than the currently achieved yield. For the livestock rearing sector, the potential of production growth is estimated for milk, beef,

pork, poultry and eggs. The evolution of the productivity of livestock farming for 1990-2011 is presented in Table 67. In contrast with crop yields, it does not display any sharp yearly variations. Generally, a decrease in productivity can be noticed in time series during the first period of reform, although it remained minimal (from 1996 to 1998). Productivity then sharply increased over the recent years.

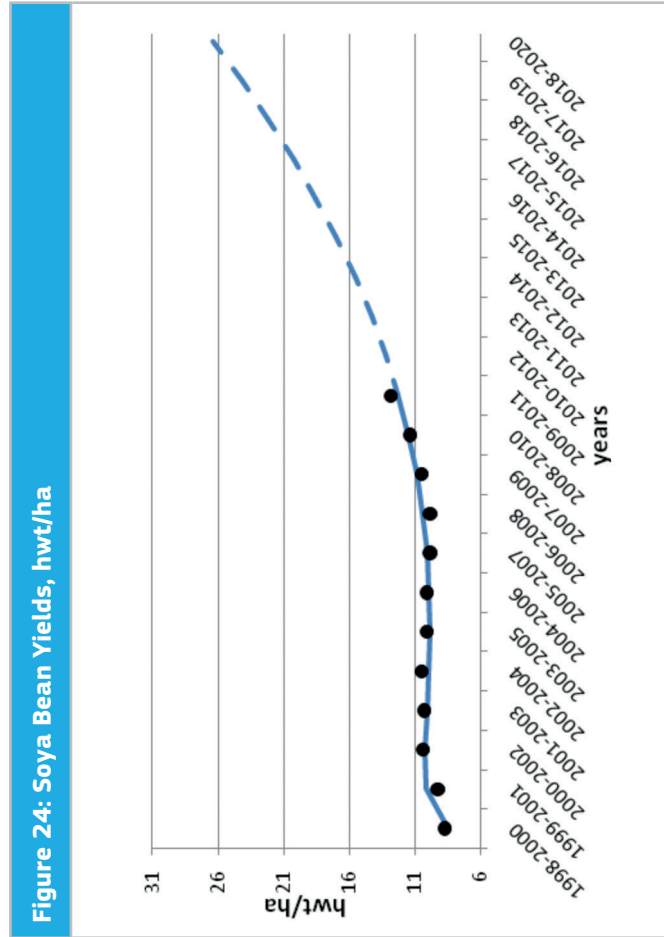
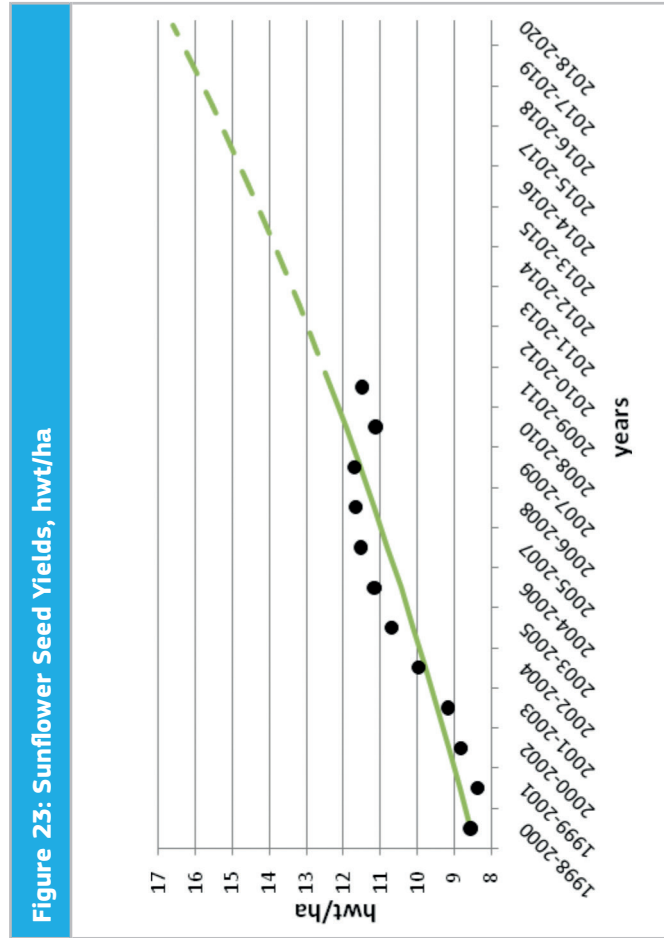
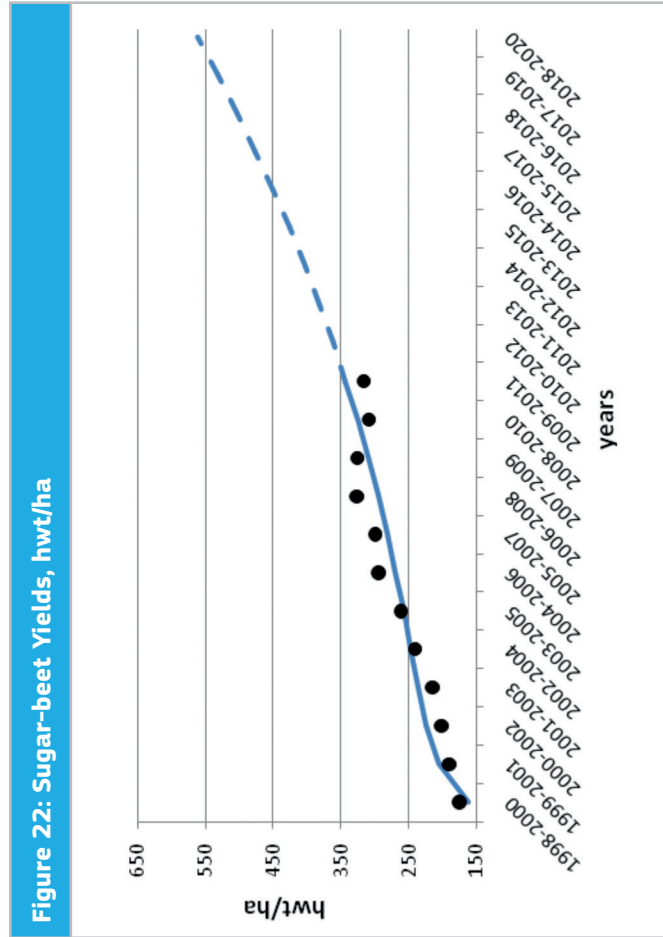
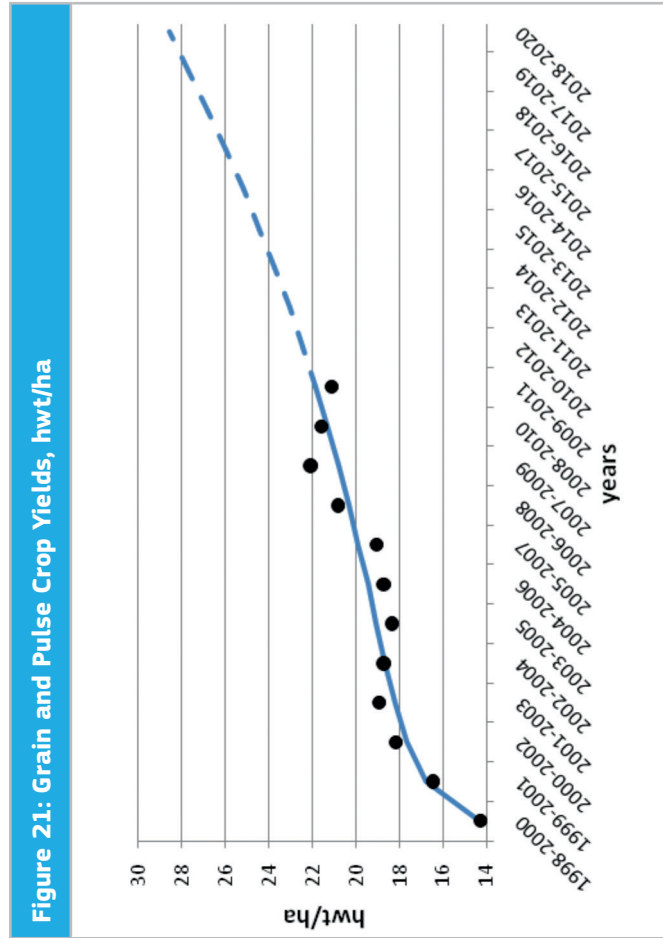


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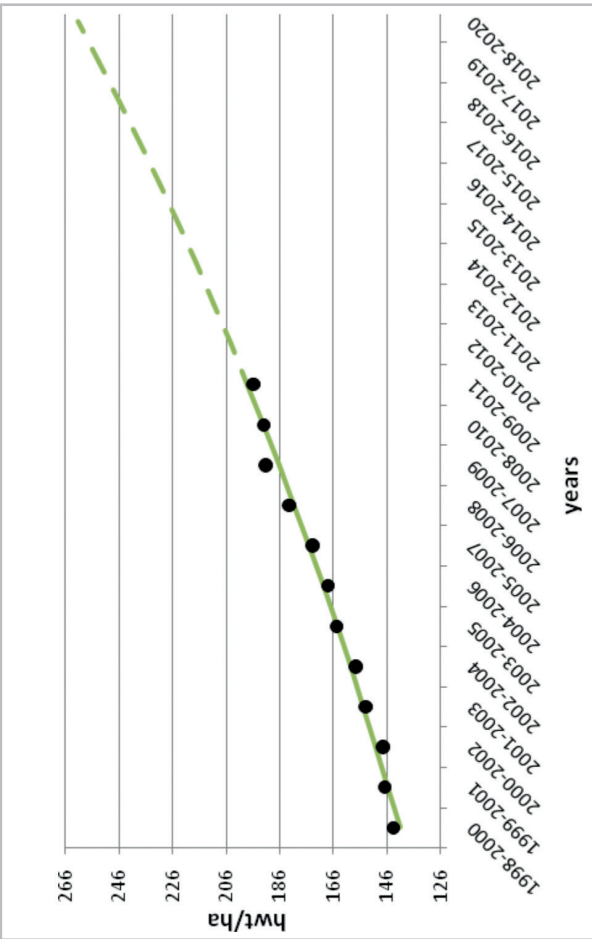


Figure 25: Potato Yields, hwt/ha

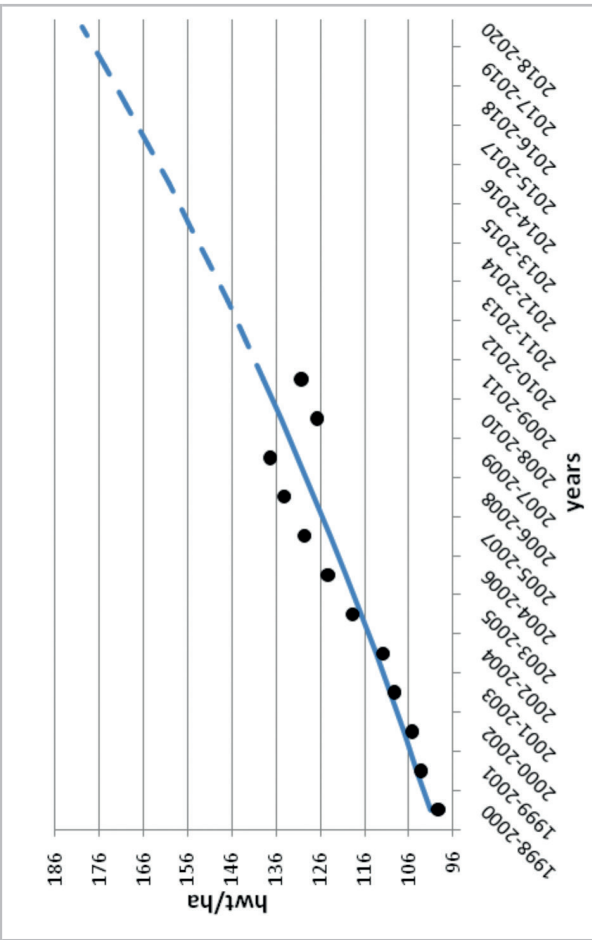
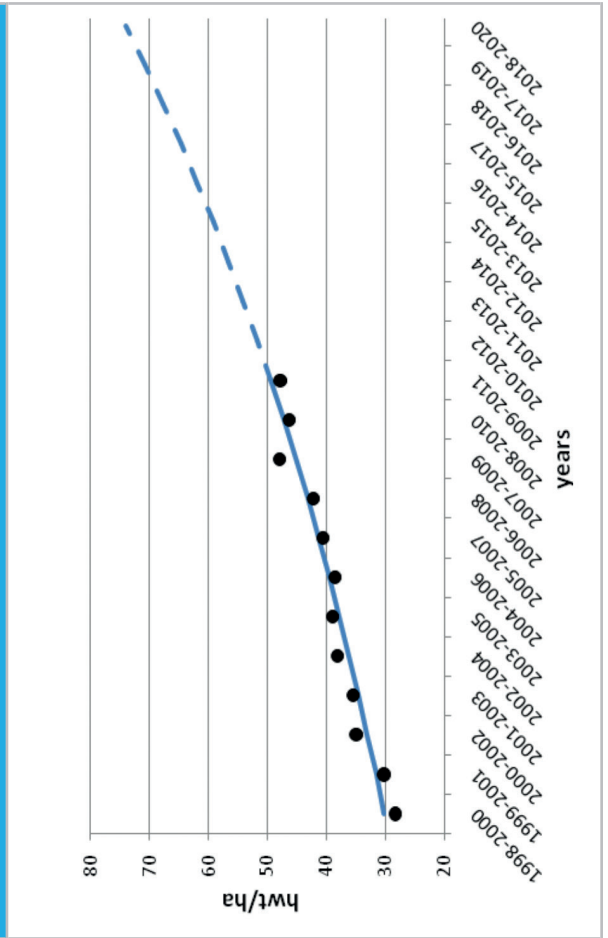


Figure 26: Fruit and Berries Yields, hwt/ha



**Table 67: Cattle and poultry productivity in the Russian Federation**

Years	Cattle weight gain, in kilograms per year	Pig weight gain, in kilograms per year	Poultry weight gain, in grams per day	Milk yield per cow, in kilograms per year	Average shearing per sheep, in kilograms per year	Average laying ability per laying chicken, in pieces (in agricultural enterprises)
1990	119	91	7.5	2,731	3.9	236
1991	117	90	7.4	2,567	3.6	231
1992	114	88	6.9	2,332	3.4	224
1993	115	85	6.2	2,328	3.3	222
1994	130	85	6.0	2,162	3	214
1995	123	82	5.6	2,153	2.9	212
1996	137	89	5.1	2,144	3	217
1997	141	89	4.8	2,239	2.9	234
1998	150	87	5.3	2,381	2.8	240
1999	125	81	5.9	2,432	2.9	248
2000	128	100	6.2	2,502	3.1	264
2001	125	93	7.0	2,651	3.1	273
2002	131	91	7.6	2,797	3.2	279
2003	143	107	8.4	2,949	3.2	285
2004	151	123	9.6	3,037	3.1	292
2005	149	114	10.6	3,176	3	301
2006	141	105	11.9	3,356	3	302
2007	139	118	13.6	3,501	2.8	303
2008	148	126	15.0	3,595	2.7	304
2009	149	126	16.1	3,737	2.8	305
2010	155	135	17.4	3,776	2.6	303
2011	147	139	18.5	-	-	309
Yield change, %	9.8	18.1	46.7	19.6	9.9	13.7

Source: author's calculations based on Rosstat data

Similar to the methodology used for crop yields, equations which give the highest values of  $R^2$  and F are chosen to approximate the time series of productivity of the livestock sector. For swine, a simple linear equation is the most suitable. A logarithmic equation is chosen for cattle weight gain and chicken laying ability, and a parabolic equation for poultry weight gain.

Estimated equations explain the productivity variations with a high level of accuracy, as indicated by Fisher's F-test and determination coefficients (Table 68). In milk yield, poultry weight gain and chicken laying ability, the  $R^2$  ranges between 0.97-0.99. It is about 0.85 in weight gain but is significantly lower (0.706) in cattle weight gain. All coefficients of regression equations are statistically significant.



**Table 68: Regression results for 1998-2011**

	Equation	R <sup>2</sup>	F	Std.Err (intercept)	p-level (intercept)
Cattle weight gain*	$y=120.997+11.552\ln(t)$	0,706	26,5	4,230	0,000
Pork weight gain*	$y=82.715+4.216t$	0,850	62,2	4,243	0,000
Poultry weight gain	$y=4.6837+0.4129t+0.0434t^2$	0,996	1300,9	0,296	0,000
Milk yield per 1 cow	$y=2265.642+5.006t^2+275.515\ln t$	0,979	250,7	68,361	0,000
Average laying ability of 1 laying chicken (in agricultural enterprises)	$y=234.4641+28.9199\ln t$	0,976	486,7	2,553	0,000

Source: author's calculations. Note: \* according to cattle and pork weight gain from 1999 to 2011

Productivity forecasts up to 2020 are estimated using predicting equations and demonstrate that keeping existing trends will allow to increase the productivity compared to 2010 and to reach milk yield rate of 5.8 tons per cow each year and poultry weight gain of 37.2 grams per day (Table 69). For cattle weight gain, the increase is only

slight, probably because this sector has not come out of the recession so far. To a different extent, the modest expected growth of laying chicken productivity can be explained by the fact that the sector has reached the maximal productivity of an egg per day (Figures 27-31).

**Figure 27: Cattle Weight Gain, kg per year**

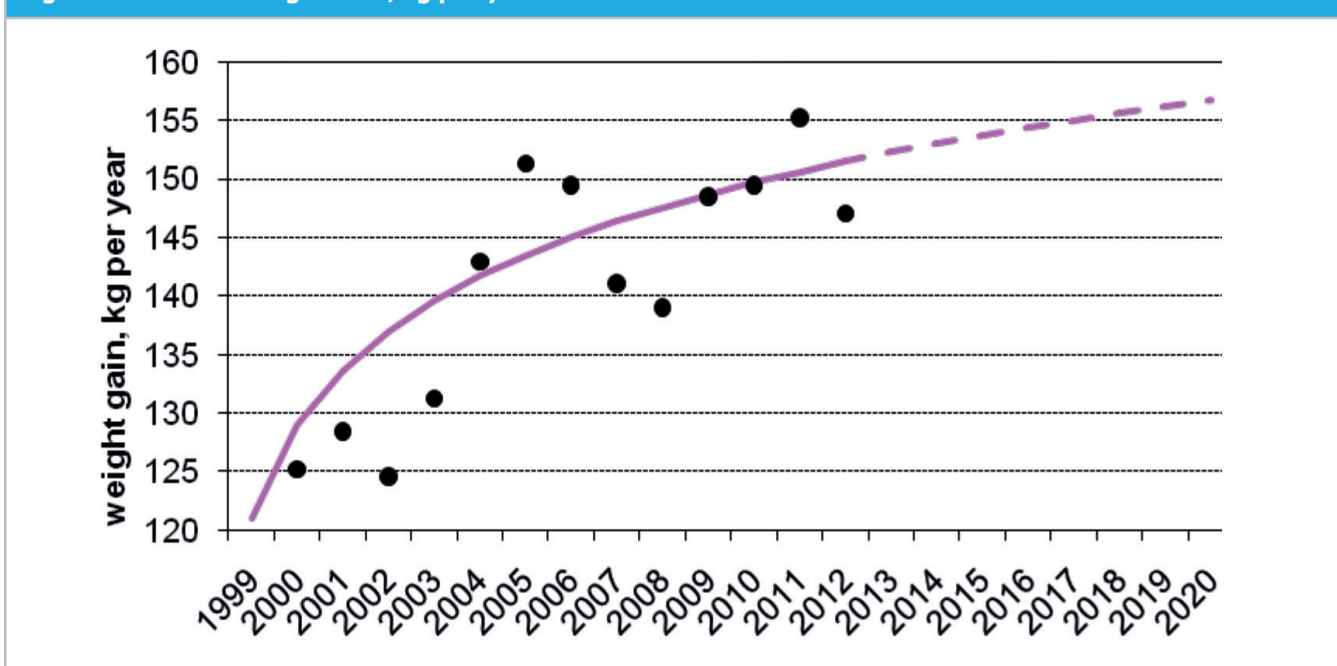


Figure 29: Poultry Weight Gain, gr. per day

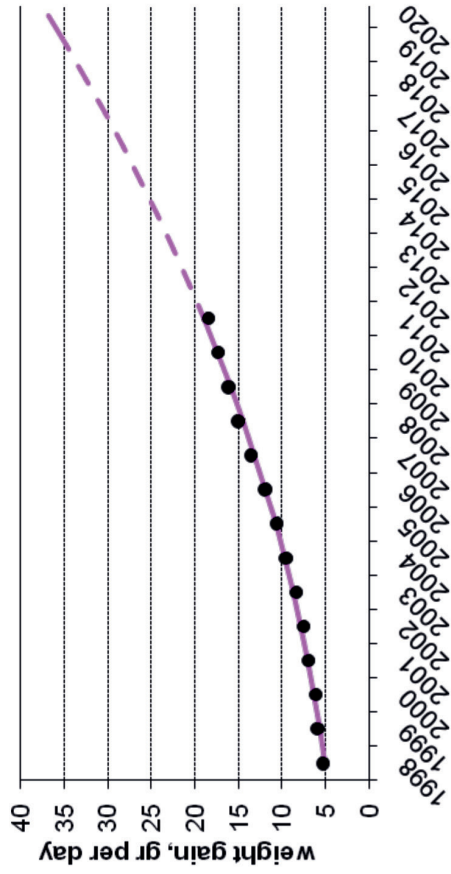


Figure 28: Pig Weight Gain, kg per year

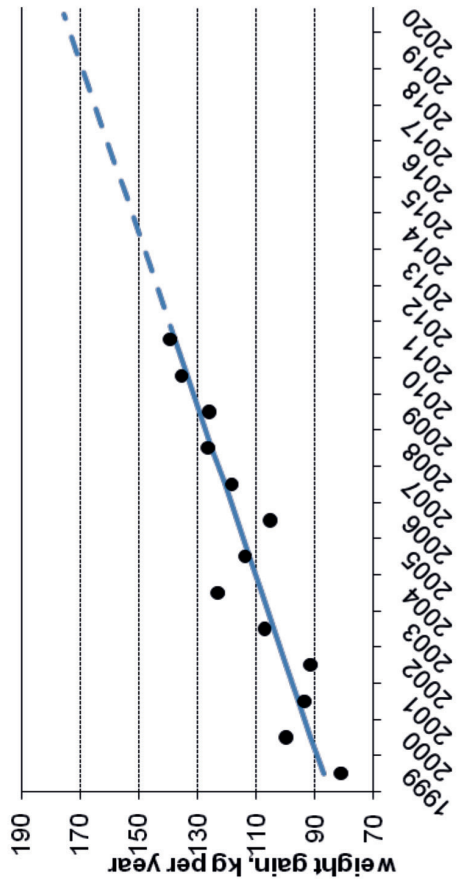


Figure 31: Average Egg-laying Rate per Laying Hen, Units

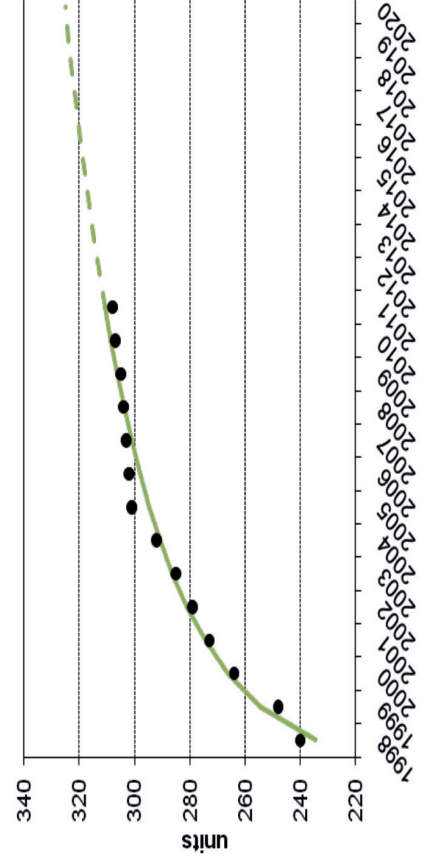
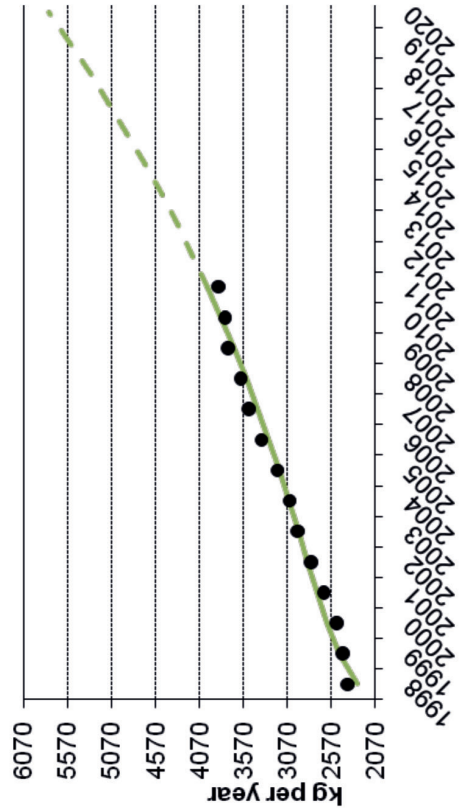


Figure 30: Milk Yield per Cow, kg per year



**Table 69: Productivity forecasts**

Years	Cattle weight gain, in kilograms per year	Pork weight gain, in kilograms per year	Poultry weight gain, in grams per day	Milk yield per cow, in kilograms per year	Average laying ability per laying chicken, in pieces (in agricultural enterprises)
2012	151.5	141.7	20.6	4, 138	312.8
2013	152.3	146.0	22.4	4, 311	314.6
2014	153.0	150.2	24.3	4, 493	316.4
2015	153.7	154.4	26.2	4, 684	318.1
2016	154.4	158.6	28.2	4, 884	319.6
2017	155.0	162.8	30.3	5, 094	321.1
2018	155.6	167.0	32.5	5, 312	322.5
2019	156.2	171.2	34.8	5, 540	323.9
2020	156.7	175.5	37.2	5, 778	325.1

Source: author's calculations

It is interesting to compare crop yields and productivity increases in Russia with those of other developed economies (Table 70). As seen from Table 70, both crop yield and productivity growth rates in Russia are significantly lower than in developed countries. The “under-par” performance of

Russia is generally explained by unfavourable environmental conditions for farming operations. Ineffective practices have played a substantial role. The situation has improved over the last years and the lag is progressively decreasing.

**Table 70: Crop yield and productivity in Russia vs. developed economies, 2007-2009**

	Russia	EU-27	USA	Canada
1. Crop yield per one harvested hectare				
Grain and pulse crops	22.1	48.2	67.7	30.4
Sugar beet	325.7	582.0	601.7	551.7
Sunflower	11.7	18.4	15.7	16.1
Potatoes	137.7	273.7	450.3	313.3
2. Productivity				
Milk yield per cow, in kilograms	3, 611	6, 026	9, 049	7, 858

Note: averages for 2007-2009. Source: Rosstat (2008-2010)

The picture is somehow different when comparing the performances of specific Russian regions with those of the countries located in similar natural zones. The comparison of Federal Districts with neighbouring countries or countries located in similar natural and climatic conditions can be found in Table 71.

**Table 71: Crop yield and productivity of the RF regions and comparable countries, 2007-2009**

	Crop yield, in hwt/ha				Milk yield per cow, in kilograms
	Grain and pulse crops	Sunflower	Sugar beet	Potatoes	
North-Western Federal District	21.9	-	-	120	4,814
Finland	36.5	-	381	268	7,972
Central Federal District	26.5	14.7	325	131	4,308
Poland	33.0	-	507	204	4,491
Southern Federal District and North-Caucasian Federal District	28.7	12.7	358	111	2,662
USA	67.7	16	603	450	9,281
Volga, Urals and Siberian Federal Districts	16.2	8.1	241	147	3,516
Canada	30.4	16	552	313	8,233
Far Eastern Federal District	13.5	9.3	-	137	2,729
New Zealand	49.0	-	-	430	3,624

Note: average for 2007-2009. Source: EMISS Rosstat database (2007-2009)

The analysis of crop yields and productivity within Russian regions with comparable countries shows that in case Russian producers reach the comparable countries' level, agricultural production given the existing areas and livestock shall increase by factors of 1.1-2.2 (Table 72). The potential growth has been estimated assuming that the existing

cultivated areas and livestock numbers are kept at the level achieved during the reporting period. Without doubt, production growth is possible provided that the additional production satisfies a demand within or outside the country and that Russian producers are competitive in both domestic and foreign markets.

**Table 72: Potential increase of the gross agricultural output in Russia (in thousand tons)**

Product	Annual average gross output of 2009-2011	Crop yield and productivity coefficient	and growth	Gross output	Increase
Grain	83,993	1.28		10,7511	23,518
Sugar beet	31,142	1.55		48,270	17,128
Sunflower	7,142	1.31		9,356	2,214
Potatoes	28,307	1.26		35,667	7,360
Field vegetables	12,826	1.28		16,417	3,591
Fruit	2,476	1.43		3,541	1,065
Milk	32,053	1.40		41,669	9,616
Beef	1,701	1.03		1,752	51
Pork	2,305	1.24		2,858	553
Poultry meat	2,859	1.81		5,175	2,316

Source: author's calculations

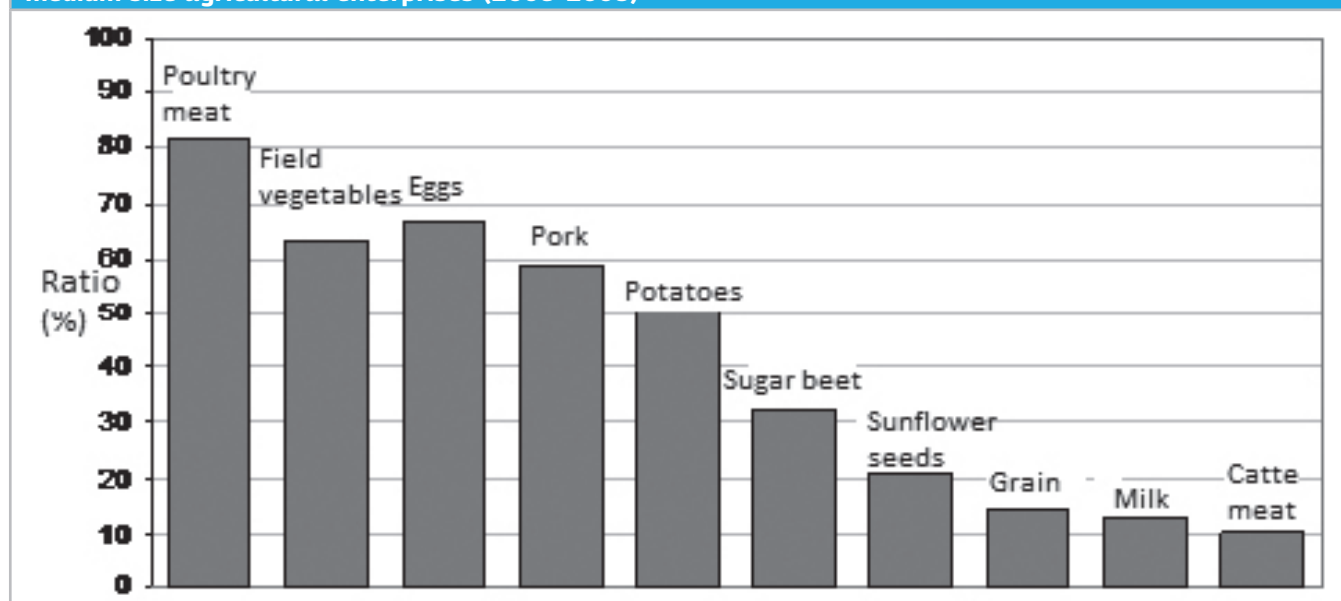
## 4.5. Technical and technological modernisation of agriculture

In Chapter 2, the analysis of technical efficiency of agricultural enterprises has shown that the efficiency of agricultural operations varies significantly by farm type and specialisation. The influence of technical and technological modernisation on agriculture is examined via the study of “*best practices*”. For this purpose, the 100 largest and most effective producers of each product class are selected. Calculations are based on data provided by the Federal State Statistics Service Main Interregional Centre for Processing and Spreading of Statistical Data. The database includes 8,500 bookkeeping reports of large and medium size agricultural organisations from 2006 to 2008. The selection within each specialisation is carried out according to three ratios: Gross output, price of the commercial product, Sales profit. Agricultural operators with *best practice* relationships are selected for

11 products: grain, sunflower, sugar beet, potatoes, field vegetables, milk, cattle meat, pork, poultry meat and eggs. All agricultural organisations are then classified according to the sum of their ranks by the three criteria, the total of which determined the place of an enterprise in the entire group.

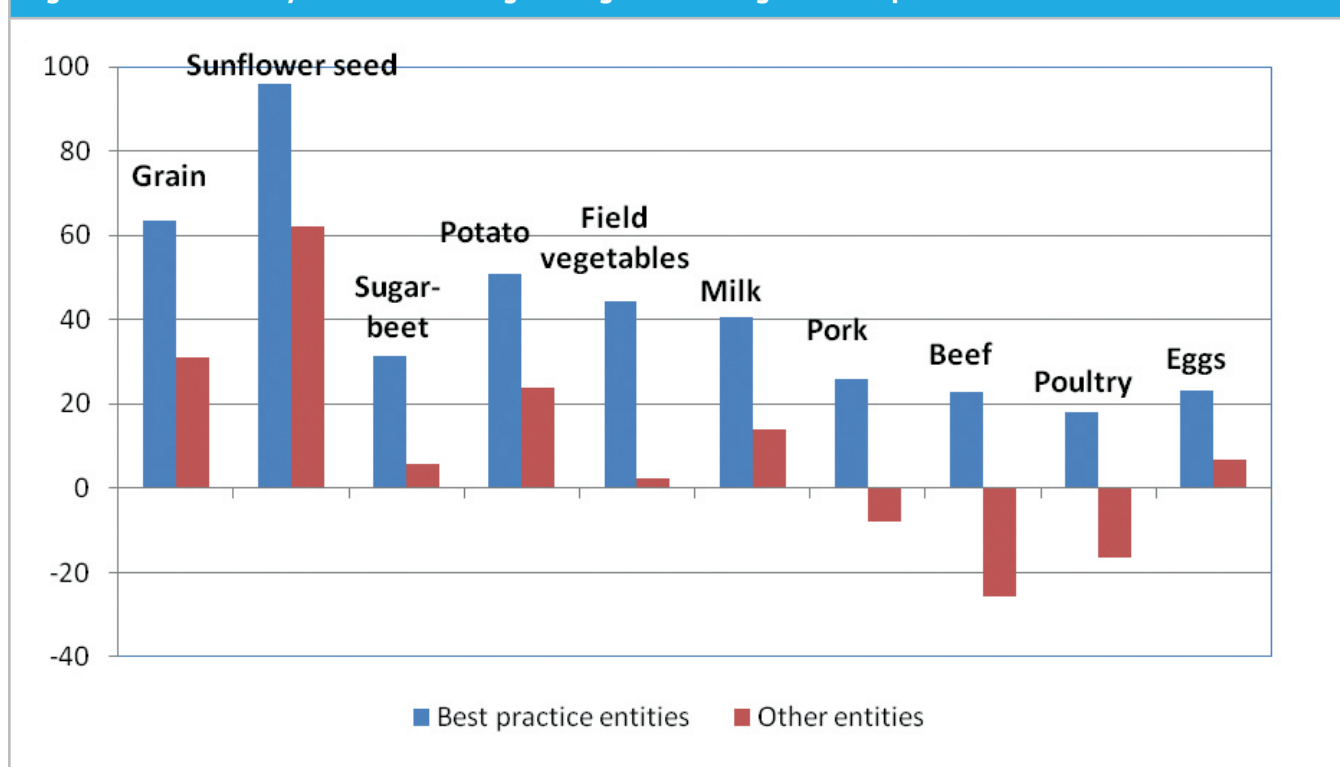
The 100 agricultural operators, selected for each product, stand for only 1.2% of all large- and medium-sized agricultural enterprises in Russia. However, they play a significant role in the industry. For example, the 100 large size producers account for 81.7% of the Russian large and medium size agricultural enterprises’ profit from poultry meat sales, 66.5% of eggs sales, 63.0% of the sold field vegetables, more than a half of pork sales, 50.6% of potatoes and 32.6% of sugar beet (Figure 32). Similarly, the share of 100 large size producers in the sunflower sales (20.9%) is rather high. Regarding grain, milk and cattle meat, the largest producers on average in 2008-2009 accounted for 10.3-14.5% of the commercial product sales.

**Figure 32. Share of the “best practice” agricultural operators in commercial production of large and medium size agricultural enterprises (2006-2008)**



The largest producers have a much higher productive effectiveness, than the rest of agricultural operators in Russia. Profitability levels in those agricultural operators are from 16 to 48 points higher than for the rest of farm operators. The greatest difference is in the level of livestock farming profitability. Pork, cattle and poultry meat production is profitable in the best agricultural operators (18.1/25.8%) and negative in other agricultural operators (Figure 33). The comparative analysis of the largest producers’ effectiveness sheds lights on the fact that other agricultural enterprises increase their effectiveness, to become competitive in the market. The elements, allowing the best agricultural operators to achieve such high effectiveness are the scale of production, specialisation, high crop yields, high quality and high product price, low production costs.

**Figure 33: Profitability levels of the largest/large/medium agricultural producers**



**Table 73: Crop yield and productivity<sup>66</sup> (2006-2008)**

Product	Best farming units	Other farming units	Best farming units in % to other farming units
Grain	37.8	20.0	189.2
Sunflower	17.3	11.7	147.6
Sugar beet	365.6	302.2	121.0
Potato	258.7	164.0	157.7
Field vegetables	400.8	154.6	259.3
Milk	6,307.5	3,738.6	168.7
Meat:			
cattle	619.9	421.7	147.0
pork	450.9	285.7	157.8
poultry	45.1	18.1	249.7
Eggs	314.4	274.8	114.4

Source: author's calculations

66 Crop yield in hwt/ha, cow productivity in kilograms per year, weight gain in gram/head per day, laying ability in pieces per year)

**Table 74: Expenditures per hectare and per head (2006-2008)**

	Expenditures per one hectare and one head, in thousand roubles		Best farming units in % to other farming units
	Best farming units	Other farming units	
Grain	8.9	3.8	235.4
Sunflower	6.9	4.7	146.1
Sugar beet	24.9	20.9	119.5
Potatoes	74.9	40.6	184.7
Vegetables	139.8	55.0	254.0
Dairy cattle	47.1	25.6	183.7
Fattened cattle	12.4	11.1	111.7
Swine	8.3	7.1	116.1
Broilers	0.7	0.3	199.3
Laying chicken	0.5	0.5	96.1

Source: author's calculations

**Table 75: Agricultural production growth potential by means of modernisation**

Product	Gross production (excluding the best agricultural operators), thousand roubles	Gross production growth potential	Gross production growth potential, thousand tons
Grain	45,908	1.9	40,950
Sunflower	2,485	1.5	1,183
Sugar beet	16,012	1.2	3,362
Potatoes	1,165	1.6	672
Field vegetables	518	2.5	771
Milk	11,103	1.7	7,628
Meat:			
cattle	771	1.5	362
pork	325	1.6	188
poultry	402	2.5	601
Eggs	8,951	1.1	1,289

Source: author's calculations based on Rosstat data

The overall output of the main product is from 5 to 37 times higher in the best agricultural operators than in other agricultural operators which have produced the same product. Traditionally, the best agricultural operators are specialised in the production of one product. Crop yields and livestock productivity are from 1.1 to 2.6 times higher with the largest agricultural operators than in other Russian agricultural enterprises (Table 73). It is achieved as a result of organizing the production process under the most suitable conditions for the particular kind of product and adjusting the industrial

structure to the environment of the region. Higher crop yields are achieved in the best agricultural operators because of the use of higher technologies, better machinery, equipment, and finance. This is despite the fact that these agricultural operators have higher expenditures per hectare and per head (see section 3.3). Helping other agricultural operators achieving the productivity level of the best agricultural operators before 2020 could provide a significant increase in Russian agricultural production (Table 75). Expanding the existing production potential via the increase in yields,

using abandoned land, upgrading equipment and processes requires a favourable business environment, effective agrarian policies and a good governmental strategy.

## 4.6. Improving farm support policy in the context of WTO adhesion

The main direction for improving governmental agricultural support in the near future will be determined by the need to ensure food security, the protection of domestic markets and the promotion of exports of several Russian agricultural products (mainly grain, oil, poultry) in the context of WTO. Indeed, Russia must now respect trade obligations inherent to the Customs Union and WTO rules. The Ministry of Agriculture identifies the following risks of WTO accession in the Government Program for 2013–2020 as follows:

- Reduction of investment potential and of profitability of agricultural operators;
- Failure to achieve performance ratios of the food security strategy;
- Bankruptcy of small and medium operators due to the lack of competitive advantages;
- Reduction of jobs, incomes and living standards in rural areas.

In face of such risks, the Ministry of Agriculture has implemented the following measures to facilitate the adjustment of agriculture to these new conditions:

- development and approval of the MOA plan for implementing the Government Action Plan, which is aimed at smoothing the adjustment of a few sectors to the conditions of WTO membership;
- Approval of a “road map” of customs/tariff and non-tariff regulation of agricultural import in condition of WTO accession. The “road map” has been prepared by the MOA with participation of the industry-specific unions and combines priority areas for support within the sector, which face risks with WTO accession;
- Development of Russian national standards and system of beef quality assessment.

To overcome any possible negative consequences, the State program foresees to:

- Extend the validity term of a number of tax benefits for agricultural operators, including the profit tax benefit until 2020, VAT benefits when importing pedigree cattle, embryos and semen until 2020;

- Adopt a federal law “On veterinary service” aimed at improved legal regulation in veterinary sphere and harmonisation of domestic laws with requirements of international organisations;
- Make a list of agricultural products and food which shall not be procured for state and municipal needs unless the country of origin is the a country of Common Economic Area;
- Improve the Federal customs service activity in handling imports of agricultural products (especially beef);
- Amend the law “On Agriculture” by defining criteria of regions unfavourable for agricultural activity. Support for such region will belong to the “green box”, therefore the payments to agricultural producers shall not fall under limitations;
- Stimulate demand for agricultural inputs and food by providing government aid to low-income groups of population, supporting catering systems for certain social groups (e.g. school meals), reforming the system of food procurement for government needs (e.g. procurement of domestic food products by the ministry of defence, procurement of products for the State Reserve, etc.).

The most important decision is the commitment to limit “amber box” support in line with WTO requirements. For Russia, the permitted level of support is 9 billion US dollars, which by 2018 shall be reduced to 4.4 billion US dollars and shall be maintained at that level afterwards. According to the head of the Department for Agricultural and Food Market Regulation and Infrastructure Development of the RF Ministry of Agriculture, “in 2012 the entire amount of the State budget (of all levels) support shall total 5.6 billion US dollars”. If we single out the “amber box” support, it shall be about 3.8 billion US dollars. Therefore, the Ministry of Agriculture concluded, “there is still some room for increasing government support”<sup>67</sup>.

However, according to forecasts by 2018, gross agricultural production shall grow from 3.6 trillion roubles in 2012 to 5.5 trillion roubles (from 113.7 to 195.3 billion of US dollars accordingly). Therefore, the actual share of support in the cost of gross production shall reduce from 3.3% in 2012 to 2.3%, if we assume that Russia does not exceed the “amber box” support ceiling amount of 4.4 billion US dollars. In addition, there are commitments related to tariffs and bans on export subsidies. They reduce Russia’s capacity to protect domestic market in a context where several developed WTO members keep a much higher level of support and even rights of export subsidies.

<sup>67</sup> Russia’s joining WTO shall not reflect on the level of state support for agriculture in 2012 (“RIA Novosti”, 02.03.2012). - [http://www.wto.ru/ru/news.asp?msg\\_id=28878](http://www.wto.ru/ru/news.asp?msg_id=28878)



One of the priorities for the protection of domestic producers shall pass through the transfer of state support measures from the Amber to the Green Box, e.g. tariff benefits for transportation of agricultural products by railway and direct support measures can be regarded as support to economically disadvantaged regions, prevailing in Russia. The second target area for protection measures could be banning imports when such ban is in compliance with the Agreement on Sanitary and Phytosanitary Measures. For example, one of the WTO accession commitments is to reduce import duties on live pigs from 40 to 5%, which has alarmed many businesses in the sector and banks, which provided credits for the construction of large pig-rearing farms. Since February 2012, Russia has already introduced a ban on import of bovine cattle and small cattle and pigs from the EU in connection with *“the outbreak of disease caused by the Schmallenberg virus and another viral disease called bluetongue... Russia has not received from the EU the information requested back in January 2012 on the implemented epizootic measures and the associated research materials”*<sup>68</sup>. Officially, there is no connection between the reduction of industry protection upon joining WTO and the implementation of import bans on grounds of threat to people, animals and plants, but it is obvious such a ban works towards the protection of domestic markets.

Another instrument for improving government support policy could focus on the establishment of clear and strong procedures for regional support, in particular when regions provide “Amber box” support to their agricultural operators. At the moment, there are no limitations on such support from the regions, which makes it difficult to control the country’s compliance. In addition, Russia will have to comply with the Custom Union requirements. For instance, in the past, processors received interest rate subsidies when they borrowed loans to buy domestically produced materials. Now, it will be necessary to extend this benefit to imported materials.

The newly approved Government Program for 2013-2020 takes WTO requirements into account mainly by ensuring that the budget support shall not exceed the limits established by the AMS Agreement. The Government Program did not pass massive amendments in connection to the WTO adhesion, except for measures to support plant-growing. In particular the “Plant-growing” subprogram now envisages a new federal subsidy to the regions “for untied plant-growing support aimed at supporting incomes agricultural operators specialising in plant-growing”. Parallely, federal subsidies for growing flax, hemp, means of rapeseed chemical protection and mineral fertilisers, seen as Amber Box, have been eliminated (2013). The new protective measure is going to be substantially funded and the funding shall increase

in future from 9.7 billion roubles in 2012<sup>69</sup> to 37.6 billion roubles by 2020.

In general, as it has been previously explained, the Government Program has kept existing support measures and included a number of additional instruments. In particular, some new “green box” measures included have been to support smaller organisations. There are four important tools:

- Support to start-up family farms in the form of grants for the establishment and development of family farms and lump-sum payments for the setting-up of premises,
- Support to family livestock farms in the form of grants for the setting-up or modifications of livestock farm premises;
- Support to agricultural consumer cooperatives in the form of compensation based on the share of their membership fees payable to the inspection unions;
- Compensations to family farms of at least 50% of costs of registering property titles to agricultural land which they use.

Despite the fact that aggregate expenditures to support small farms from budgets of all levels shall grow from 6.2 billion roubles in 2010 to 14.2 billion roubles in 2020, the share of these new measures in the consolidated budgets of the Ministry of Agriculture and regions shall be quite small and in 2020 shall be about 4.3%. Overall, any changes in the policy for state support of agriculture will take place gradually and in future, when the actual effect of joining WTO for agriculture and processing becomes clearer. However, it is important to mention that there may be likely changes:

- state support channelled through “green box” measures (aid to disadvantaged areas, untied support of revenue in plant-growing);
- reduction of interest rate subsidies share in the funding (cancelling subsidised short-term credit in plant-growing, higher eligibility requirements for investment credit by introduction of tender procedures, reduction of share of financing from the federal budget);
- continued support for livestock farming (starting with 2013 introduced is a subsidy per litre of sold milk, more beneficial terms of interest rate subsidies; within the Government program Livestock development is singled out as a special Subprogram with total funding from the federal budget totalling 6.8 billion roubles for 2013 and subsequent increase to 9.5 billion roubles in 2020);
- Enhancing support of other agrarian sector operators (processors and producers of equipment), which, apart

68 Rosselkhoznadzor introduces a ban on importing livestock from the EU starting March 20. - <http://www.rbc.ru/rbcfreenews/20120302191625.shtml>

69 In 2012, this amount includes subsidies for mineral fertilisers in the amount of 5.2 billion roubles.

from producers, play an important role for infrastructure development. Instead of compensation of interest rate for procurement of agricultural equipment the 2013-2020 Government program plans to subsidise producers of equipment for loss of revenue due to trading with agricultural producers. The subsidies amount to 2 billion roubles per year from the federal budget. The above-mentioned loss of revenue is formed due to sales of equipment with discounts.

- More focus on social development of rural areas (more funds in the Federal Target program “Sustainable development of rural areas” from 8.7 billion roubles in 2012 to 19.2 billion roubles in 2020. More responsibility to the regions for development of the social sphere by including such a clause in the Agreement on co-funding between the regions and RF MOA).

## 4.7. Concluding remarks

- Russia has over 90 million ha of abandoned agricultural land, but it is mainly located in areas with low bioclimatic potential. This land mainly belongs to non-operating agricultural enterprises, family farms and household plots located in the Northern and Eastern areas and in the Non-black soil zone.
  - The reasons for the withdrawal of these areas have been the low effectiveness of such land, as well as difficulties with allotment, registration and sale/purchase (i.e. high transaction costs). Also, migrations to urban areas have led to land being withdrawn from use.
  - Policy changes in land market regulations, which could lower transaction costs, as well as in rural development, which could lessen the income gap between rural and urban areas and therefore make rural areas more attractive, might offset land abandonment trends.
- The methodology used in this report to assess Russia’s potential to increase grain export takes into account the correlation between the growth of land areas and grain sales profitability; the cost of production of a tonne of grain in each Russian region; the cost of transporting grain by railway to export terminals, and the global grain price.
  - Although this methodology has some caveats, the assessment provides some clear insights; that is, Russia has some potential of using abandoned land and increasing its grain export. However, this potential is limited, unless market conditions drastically change.
  - The modernisation of production systems, the application of modern technologies, the introduction of innovations, the establishment of clear and strong procedures for input and output markets as well as the provision of support, all have a large potential to increase agricultural output and therefore contribute to domestic food security and global food markets. Policy-makers (and the agri-economy) may benefit from paying attention to these fundamental elements.
  - Russia experiences a serious mismatch between its grain production potential and its export potential. The latter is structurally restricted by the lack of storage, transshipment and carriage capacities which limit the potential of Russia to export the excess production. Given gross grain yield forecasts for 2020 (~133/136 million tons) and the expected growth of oil crop yields, the existing shortage of storage capacity is unlikely to be eliminated without the implementation of large investments.

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#### Abstract

As the recent situation on world food markets has been increasingly volatile and has been associated with relatively higher food prices, contributing to demonstrations and riots across the world, Russia's agriculture has attracted much attention from economists, experts and policy-makers because they believe that the country could become the world's largest and most reliable grain producer and exporter. In that context, the aim of this report is to evaluate the role of the Russian Federation towards fulfilling domestic food security and more importantly global food security in the short and medium run. In particular, the study aims at examining if Russian farms could substantially increase further their respective output and export levels. The methodology followed in this report is a bottom-up approach, i.e. going from the farm (i.e. microeconomic level) to the food market (i.e. macroeconomic level), that explicitly considers the analysis of food security at the farm level and therefore complements well other works which study the agri-food sector in Russia at a more aggregated level. The perspective of the report is made possible by the use of a wide range of farm-level databases that are, for most, only available to Russian researchers and allow going into a more disaggregated and detailed level of analysis.

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